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Modern Locomotive Construction.

By J. G. A. Meyer.

TWELFTH PAPER.

HOW TO FIND THE POSITION OF THE ECCENTRIC SUITABLE FOR ANY ONE OF THE DIFFERENT POSITIONS OF THE VALVE.

We have stated in a previous paper, that, for the constuction of a slide valve and for the purpose of following the movements of the same, all that will be required is a section of the valve, the valve seat, and the circumference of a circle to represent the path of the center of eccentric, and such we shall now employ in the solution of the following problems.

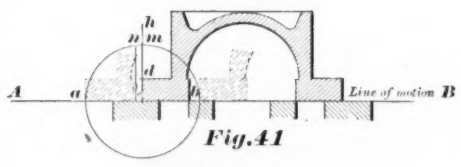


Fig.41

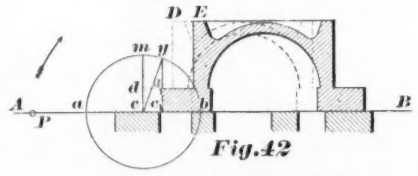


Fig.42

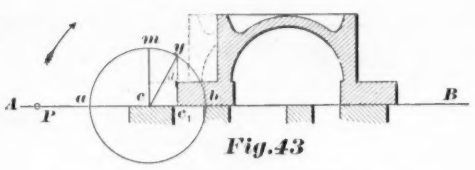


Fig.43

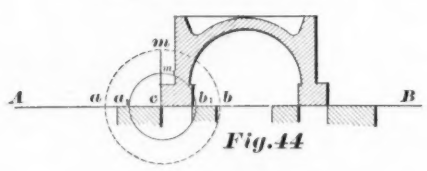


Fig.44

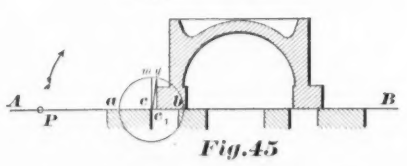


Fig.45

By the center of eccentric we mean the center x, Fig. 40, and not the center c of the hole. The center line of an eccentric is a straight line drawn through the centers x and c, and produced to the circumference of the eccentric. Fig. 41 shows the valve seat with the steam ports and exhaust port, also the valve standing in the center of its travel. This position of the valve is an important one, because to this we generally refer when any other position of the valve is to be considered. From the point c (the intersection of the lines $A\ B$ and $d\ e$) as a center and a radius equal to half the throw of the eccentric, a circle has been drawn; the circumference of this circle will represent the path of the center x of the eccentric. Now, it must be remembered that in studying the laws relating to the construction and movement of the slide-valve, the length of the eccentric rod is always considered to be an infinite length, or in other words, that the eccentric acts precisely in the same manner as a pin working in a slotted crosshead forged to the valve stem, such as we have already described. Keeping this in mind the following explanation will be easily understood:

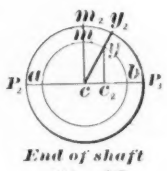
The line $A\ B$, Fig. 41, we will name the "line of motion," because it shows the direction in which the valve moves. For instance, in the figure before us, the line $A\ B$ indicates that the valve travels in a horizontal direction. The diameter $a\ b$ of the circle $a\ b\ m$ coincides with the line of motion $A\ B$, consequently when the center of the eccentric is at b the valve will be at the forward end of its travel, as shown in dotted lines, and at the same time indicating how far the valve will travel beyond the edge of the steam port. When the center of the eccentric is at a the valve will then stand at the opposite end of its travel, also shown by dotted lines. Now, when the valve stands in its central position, the center of the eccentric must also stand in the center of its path from a to b, and consequently will be at m. To find the point m we draw a straight line $c\ h$ through the center c of the circle, and perpendicular to the line of motion $A\ B$, the point of intersection of the line $c\ h$ and the circumference will be the point m. So also in a similar manner we may find the position of the center of the eccentric for any other position of the valve. For instance, if the edge c of the valve stands at g, we draw through the point g a line perpendicular to the line $A\ B$; the point of intersection n of this line and the circumference $a\ b\ m$ will be the center of the eccentric, when the valve stands at g.

In order to save time and labor, and to make the solutions of the problems as simple as possible it is always best to place the valve, as we have done, in the center of its travel, and then adopt c, the point of intersection of the outer edge of the valve and the line $A\ B$ as the center of the circle whose circumference is to represent the path of the center of eccentric.

LINEAR ADVANCE OF THE VALVE, AND ANGULAR ADVANCE OF THE ECCENTRIC.

In connection with the setting of the eccentric two terms are used, namely, "linear advance of the valve, and angular advance of the eccentric." Between these two there exists such a close relation that if we change one we must also change the other, and if there is no linear advance of the valve there will be no angular advance of the eccentric, therefore it is of great importance to understand the meaning of these terms.

In Fig. 42 we have shown the valve in two positions. The dotted lines represent the valve standing in the center of its travel, and is marked D. The section of the valve in full lines, marked E, represents its position at the commencement of the stroke of the piston (it will be noticed here that the valve has lead), the distance from c to c_1 is called linear advance of the valve, and is equal to the lap and lead, plainly shown in the figure; in short, linear advance of the valve means the distance the valve has traveled beyond its middle position when the piston has reached the end of the stroke. When the valve stands in the middle position D, the center of the eccentric will be at m, and a line drawn from c to m will represent the center line of the eccentric. Again,


End of shaft
Fig.48

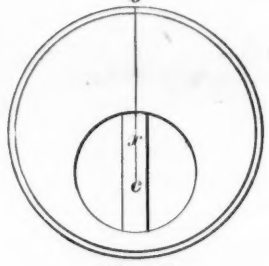


Fig.40

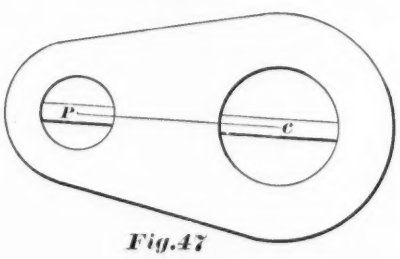


Fig.47

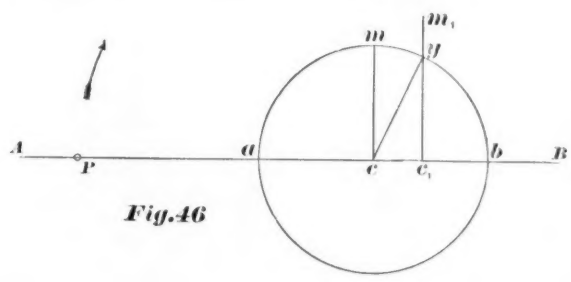


Fig.46

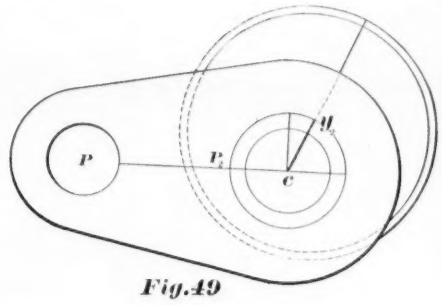


Fig.49

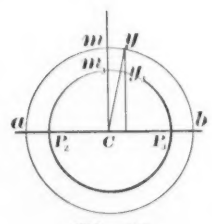
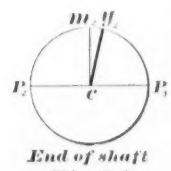


Fig.50


End of shaft
Fig.51

In this figure we notice that the valve does not travel as far beyond the inner edge of the steam port, as in Fig. 42.

If the lap is made less than shown in Fig. 42, without changing the travel and the lead of the valve, the linear advance will be less, and, consequently, the angular advance will be smaller. In this particular case the center c would have to be moved closer to the edge of the steam port, because the lap is smaller. When the valve has no lap and lead, as shown in Fig. 44, there will be no linear advance, and, consequently, no angular advance. In this case the center c will be on the outer edge of the steam port. If the travel of the valve is the same as that in Fig. 43, and indicated by the diameter of the dotted circle $a\ m\ b$, in Fig. 44, we notice that in the latter figure the travel is too great; our circle shows that the valve will travel beyond the bridge, and thus open the exhaust port to the steam in the steam-chest; therefore, the travel must be reduced, as shown by the circumference $a_1\ m_1\ b_1$ in a full line. Lastly, if lead is given to a valve that has no lap, as shown in Fig. 45, then we have again linear advance, and, consequently, there will be a corresponding amount of angular advance. In this case the center c will remain on the outside edge of the steam port.

TO FIND THE RELATIVE POSITION OF THE ECCENTRIC TO THAT OF THE CRANK.

In our last paper it was shown how to set an eccentric for a valve without lap and lead. In that particular example the center line of the eccentric was placed perpendicular to the center line of crank. These relative positions are only true for engines in which all the connections are direct, such as shown in Fig. 30. When other connections are used, such as rockers, &c., it may happen that for some engines the eccentric would have to be set at right angles to the crank, or as the practical man would say, "the eccentric set square with the crank," and yet for other engines this would be wrong.

In this paper we will consider only the relative position of eccentric to that of the crank for simple engines such as represented by Fig. 30.

The position of the valve in Fig. 45 indicates that the piston stands at the commencement of its stroke, because the small opening of steam port here shown is supposed to be lead and no more. Now, assume that the point c is not only the center of the circle whose circumference represents the path of the center of eccentric, but is also the center of the crank-shaft, consequently the center line of crank-shaft must pass through c, and

since all the connections between crank-shaft and cylinder are direct, the center line of crank must coincide with the line $A\ B$. Again, the valve has opened the left-hand steam port, therefore the center P of the crank-pin must also be on the left-hand side of c, and in the line $A\ B$. Lastly, the point y is the center of the eccentric, and since the eccentric must travel ahead of the crank in this class of engines, we conclude that the crank is designed to turn in the direction as indicated by the arrow. In a similar manner, and for similar reasons, it can be proved that when the small openings of the steam ports, as shown in Figs. 42 and 43, represent lead, then the crank-pin must occupy the position shown in these figures.

Notice now the fact that in all the Figs. 42, 43 and 45, the center line $c\ m$ is perpendicular to the center line of crank $P\ c$, and the angular advance is laid off from the line $c\ m$ towards the right (away from the crank-pin). Also notice another important fact; the distance between the lines $c\ m$ and $c_1\ y$ in all these figures is equal to the linear advance; therefore in order to find the point y we must lay off the linear advance on a line perpendicular to the line $c\ m$, and not on the arc $m\ y$.

These facts are principles which are applicable to everyday practice. For instance:

Ex. 16. Travel of the valve is 5 inches, lap 1 inch, lead $\frac{1}{16}$ of an inch, and the direction in which the crank is to move is indicated by the arrow Fig. 46. Find the relative position of the eccentric to that of the crank.

Draw the straight line $A\ B$ as in Fig. 46, let the point P, on the line $A\ B$, represent the center of the crank-pin, and the point c on the same line represent the center of the shaft. From c as a center, and with a radius equal to $2\frac{1}{2}$ inches (which is half the throw of the eccentric) draw a circle $a\ b\ m$, the circumference of this circle will represent the path of the center of the eccentric. From c, lay off towards the right a point c_1 $1\frac{1}{16}$ inch from c (this $1\frac{1}{16}$ inch is the sum of the lap and lead), through c_1 draw a line $c_1\ m_1$ perpendicular to $A\ B$, this line $c_1\ m_1$ will intersect the circumference $a\ b\ m$ in the point y, and this point will be the center of the eccentric when the crank occupies the position as shown. Through the point c draw a line perpendicular to $A\ B$, also a line through the points c and y, then the angle $m\ c\ y$ will be the angular advance, and the distance from c to c_1 the linear advance.

These principles are also applicable to shop practice.

Example 17.—Fig. 40 represents an eccentric; Fig. 47, a crank; Fig. 48, the end of a crank-shaft. It is required to fasten to the crank-shaft the crank and eccentric in their correct relative positions before the shaft is placed in its bearings. The lap of the valve is $\frac{7}{8}$ of an inch, and the lead $\frac{1}{16}$ of an inch.

We must first find the half-throw of the eccentric. In this case, see Fig. 40, the diameter of the shaft being greater than the throw of the eccentric, we must force a strip of wood in the hole of the eccentric, and on this strip find the center c of the hole, and the center x of the eccentric; the distance between c and x is equal to half the throw. Through c and x draw a straight line $c\ g$; this line will be recognized as the center line of the eccentric.

Fig. 47. On the face of the crank draw through the centers c and P a straight line, which will be the center line of crank.

Fig. 48. Through the center c of the shaft draw any straight line, as $P_2\ P_3$. From the center c, and with a radius equal to half the throw of the eccentric, draw on the end of the shaft a circle $a\ b\ m$. On the line $P_2\ P_3$ lay off a point c_2 $\frac{15}{16}$ of an inch from the center c; through the point c_2 draw a straight line perpendicular to $P_2\ P_3$, intersecting the circumference $a\ b\ m$ in the point y; through the points c and y draw the straight line $c\ y_2$.

Fig. 49. Place the crank on the shaft so that its center line $P\ c$ will coincide with $P_2\ c$ on the shaft, and then fasten the crank.

Place the eccentric on the shaft so that its center line $g\ c$ will coincide with $c\ y_2$ on the shaft, and fasten the eccentric.

The crank and eccentric will then have the correct position on the shaft, and must not be changed for a valve having $\frac{7}{8}$ of an inch lap and $\frac{1}{16}$ of an inch lead. We here again call the attention of the reader to the fact that these relative positions of crank and eccentric are only correct for engines in which all the connections are direct, and no rocker used.

When it is necessary to place the crank and the eccentric some distance from the end of the shaft, it will be an easy matter to draw on the outside of the shaft lines through the points P and y_2 parallel to the axis of the shaft, and then set the crank and eccentric to these lines.

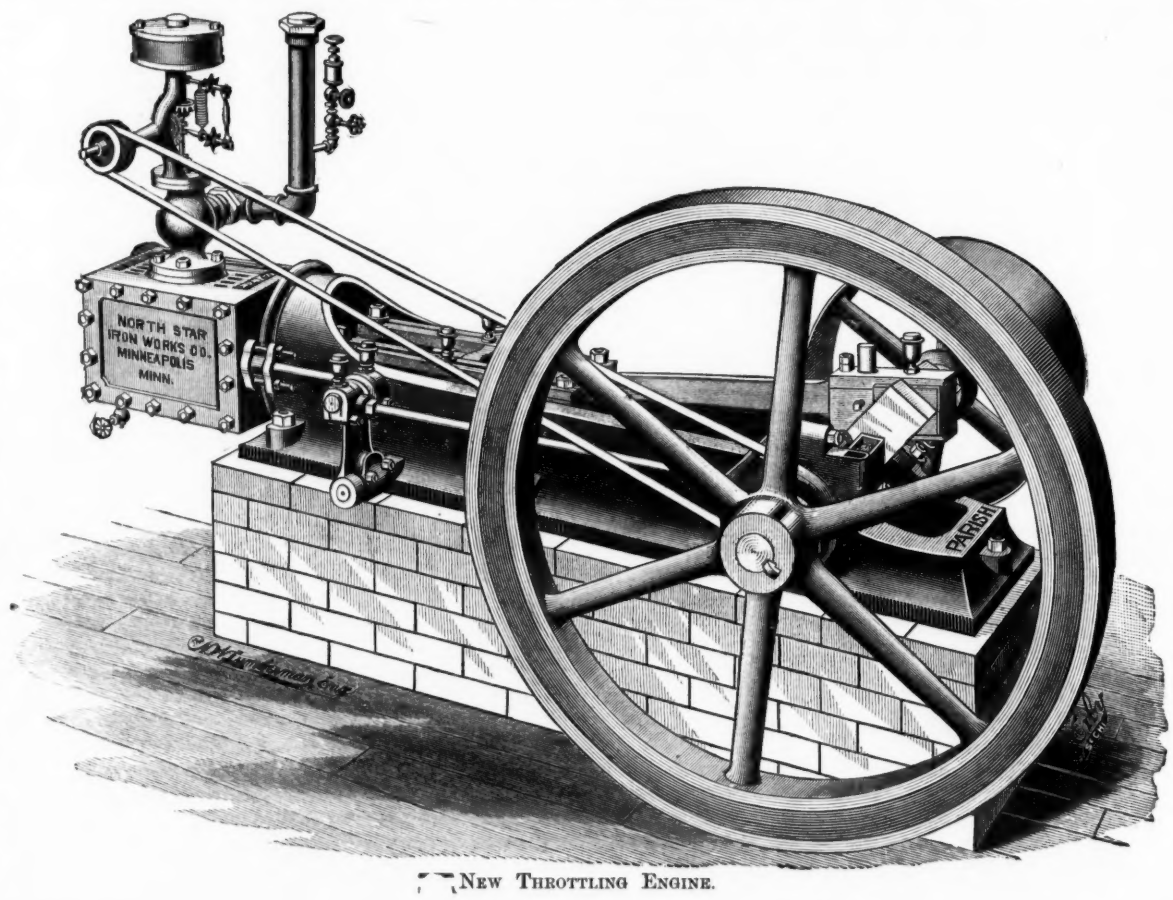
Should it so happen that the throw of the eccentric is larger than the diameter of the shaft (but which seldom occurs), draw on paper or on a board any straight line $a\ b$, as in Fig. 50, and from a point C on this line as a center, and with a radius equal to half the throw of the eccentric, draw the circle $a\ b\ m$. Find the point y in the circumference $a\ b\ m$ in the same manner as the point y in Fig. 46 has been found, and then draw the lines $m\ C$ and $y\ C$. From the center C, and with a radius equal to half the diameter of the shaft, draw the circle $P_2\ P_3$, whose circumference will intersect the straight lines $m\ C$ and $y\ C$ in the points m_3 and y_3. Through the center c of the shaft, see Fig. 51, draw a straight line $P_2\ P_3$, and also the line $m_3\ c$ perpendicular to $P_2\ P_3$; make the arc $m_3\ y_3$ equal to $m_3\ y_3$ in Fig. 50; draw on the end of the shaft the line $y_2\ c$; set the eccentric to the line $y_2\ c$, and the crank to the line $c\ P_2$.

New Throttling Engine.

The engraving with this represents the Parish throttling engine, made by the North Star Iron Works Company, Minneapolis, Minn. These engines are made in sizes from 5 to 20 horse-power, by special machinery, so as to make all parts interchangeable.

The wearing parts are large, with ample arrangements for taking up wear. The connecting-rod is three times the stroke in length. The valve is the double D unbalanced slide. Center-cranks are of steel or iron, counterbalanced or not as required.

These engines are tested and inspected under steam before leaving the works; parts are numbered so that duplicates, which are kept in stock, can be quickly furnished.



New Throttling Engine.

Shop Notes.

Slocumb has got a kink in his boiler-room which is worth having. His coal shed is 100 feet from the boilers. Two men with wheel-barrows used to be on duty between coal-pile and boiler. They are gone now. The fireman and one coal-heaver do all the work, and do it easily. Slocumb built an elevated railway from the boiler to his coal heap. It was hardly a "Meigs" railway, still it had but one rail. It looked just like one of the overhead concerns that the fresh beef dealers use wherewith to run "quarters" and "halves" into their big refrigerators.

Slocumb's coal heaver would give the car a push after he had filled it with coal. That whole ton of "soft" coal would glide right into the boiler-room, and stop just in front of the boilers. It was awful handy, and it was not patented, as far as present knowledge goes.

Slocumb used to use the back part of his boiler-room for a coal-room. He soon got sick of that notion, and built a coal-shed out of doors. His coal kept catching fire from spontaneous combustion, and for many days the whole establishment would be filled with smoke and steam.

It is well known that "Cumberland" or "Blacksmiths'" coal (bituminous) will often get on fire while stored in the shed, or even piled out of doors. To extinguish such a fire is a hard job. We have hollowed out the top of a 1,000-ton pile, and kept a $2\frac{1}{2}$" stream of water from a fire pump, constantly running night and day for a week, yet the coal would burn right along.

The only way to do is to overhaul the whole. Wet it thoroughly as the men shovel it over, and you may get rid of the fire. Coal of this kind should not be kept out of doors, exposed to rain and sun. It seems to "air slack," or undergo a species of slow combustion. Keep your coal under shelter, but don't store one or two thousand tons of it under your factory, or in a tight wooden building.

Try a safety-valve every day. Rig a cord and a couple of pulleys overhead, run the cord down where you can reach it, and you can raise the valve whenever you wish. This, of course, applies to the old-fashioned ball and lever valve. It will do for a "pop" valve also, but we never knew one of that class to need starting; they are sure to go every time, and are never loaded down with old grate bars or other junk.

We have overhauled boilers when it was necessary to start the valve with a hammer. The valve was one of the old yoke concerns, the stem rusted fast in the yoke, and nobody knows when that valve worked the last time.

Wooden cogs are sometimes made on hand, ready for keying to place, but they are all just alike, and that is where the trouble comes in.

Let's go into the foundry and get a mortise gear cast. If it is a large one, the moulder will sweep it up and set the cores by a segment. If it chances to be a small gear, a pattern is used with a row of core prints each side of the pattern. Moulder sticks the cores in those holes in the sand, and thus the mortises are made.

The cores don't get in quite true. The mortises are just like them, and the cogs follow the mortises. When the cogs are all in, we find some spaces smaller than others, some cogs are a little twisted or lean a trifle, and the gear is anything but perfect.

These cogs will wear very badly. Some must be worn down before others touch and so on; the first worn teeth wear out, and the whole thing is repeated.

It is well enough to make all but the tooth of the cog, then we will key them into the gear, fill between the cogs with pieces of wood, and then turn down true on a shaft, or an arbor, not on a chuck.

Next, we will mark the pitch line on both ends of the cogs with a fine pointed tool, while it is in the lathe. Then we will knock out the filling, and space off the teeth with a pair of dividers, and space both pitch lines.

Make a template of the tooth in sheet iron or tin, punch a small hole in the center, on the pitch line. Put this template on a cog, hold it with an awl through the hole, and in the space mark. Mark out the tooth on both ends of the cog. If it is a bevel or miter gear, we must get out two templates.

After both ends of the cog are marked, we may number and take them out to finish, but will make a better job to finish up in the mortises.

If the job is done in the mill, or even in the wheel-pit, we may be obliged to run the gear by hand while we turn it down true. For this purpose we always used a common file. The end of the tang was ground up sharp, it cut a narrow chip, and was just the thing. A $\frac{1}{2}$" chisel is good for finishing up the job.

By this method, we are sure of a true gear. It will wear well, no matter how much the casting is out of true.

Every man has his hobby-horse; but quite a novel one is that of a Maine mill-owner, who has a windmill permanently operated by steam, so that the arms go round whether the wind blows or not.

From accounts recently published it appears that, taking into account a large number of German railways, no iron axles broke during their first ten years' use, but that sixteen steel axles broke within that time. For the next ten years the breakage of iron axles was the greatest.

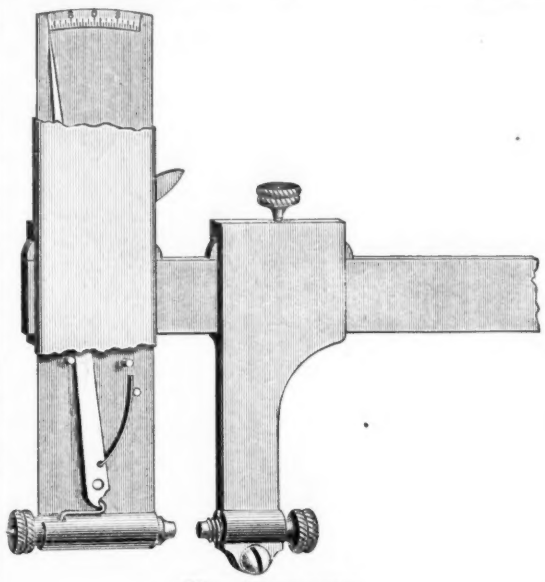
New Comparator.

This is a device for comparing magnitudes with one another, or with fixed standards. It does not measure actual sizes, but will show minute variations above or below any point at which it may be set. Its particular value is in testing parts of machines intended to be interchangeable, but it may be applied to various purposes in the machine shop.

It consists of two sliding heads fitted to be clamped upon a plain bar of any desired length. One of these heads carries simply an adjusting screw within a split nut, and a small screw to close the nut and clamp the screw. The other head has within a case a sliding spindle acting upon the short arm of an index lever. At the extremity of the other arm is an index graduated to measure the movement of the spindle in thousandths of an inch, or such other measure as may be desired. In the figure the casing is shown fractured, to expose the lever and the spring which keeps the spindle pressed forward. In using the instrument the heads are first approximately adjusted and clamped upon the bar. The standard from which comparisons are to be made is inserted between the measuring points, the sliding spindle being withdrawn sufficiently by means of the milled head. The adjusting-screw is then turned until the index stands in the middle of the graduated scale, at zero, where it is clamped The instrument being thus set, the pieces to be examined are introduced one by one, and any variation above or below the standard is read from the graduated arc.

By simply reversing the position of the heads, inside measurements may be compared, provided the opening is large enough to admit the measuring parts.

This instrument is manufactured by the Syracuse Twist Drill Company, Syracuse, N. Y.



New Comparator.

Signals to Engineers from the Deck.

A few days ago a collision took place between a steamship and a small craft on the river in consequence of the engineer not being acquainted with the system of signaling from the deck to the engine-room. The engineer had served on board a vessel which had a dial plate fitted below and manipulated by a lever attached to a quadrant on the bridge. Whenever the officer of the watch wished to give an order to the engineer a bell was rung to call "attention," and then the hand on the dial would be turned to the word of command. On being appointed to a ship belonging to another firm, the ringing of a bell instead of a premonitory signal of "attention," was an instruction to the engineer to "stop." Not having been informed that the bell was used as a direction to stop, the engineer stood watching the dial to learn what action he was to take. The bell was rung a second time, accompanied by shouting from above board. The steamer meanwhile was approaching a lighter, and before the engines could be stopped or turned astern the craft was so damaged that she sank. On this fact being communicated to us we made inquiries, and found that there was no uniformity in the signaling code. On board one ship a bell alone is used; on another the orders are given through a speaking tube; a third has an electric apparatus; a fourth is fitted with slides or ports, which open in a box in the engine-room; and a fifth sea-going ship has got no further in advance than a hand-bell. On board river steamers the "call-boy" is still heard hollowing down the engine-room skylight—"ease her," "back her," "stop her," "go ahead," "go astern." As this plan of speaking has stood its ground so many years, we may take it for granted that it has proved effectual. The "call-boy" must watch the officer on the bridge rather sharply, as the signals to the boy are shown by movements of the hand. The "call-boy" watches the officer, and as no words are spoken, he is supposed to understand every action. By constant practice the call-boys become wonderfully efficient, and it is a most unusual occurrence to hear of a mistake. When this latter happens, it is found that the attention of the boy has been directed to another quarter, or distracted by noises. Some of the electric or mechanical systems are very perfect in their motions, and considerable talent has been displayed in the appliances. But amid the multiplicity of contrivances there is no generally recognized code of signals for the instruction of the engineering department. We think that there should be a universal code for the engine-room. To prevent collision it has been found absolutely necessary to formulate rules of the sea; but these should be supplemented by a recognized code for the guidance of engineers. On the rivers and lakes of the United States the introduction of new apparatus and the dispensing with signaling by word of mouth had so completely demoralized the service, that it was found expedient to issue a code for general adoption. The Supervising Inspector-General of Shipping is empowered, under the revised statutes of the United States, to frame regulations for the safety of navigation, and in pursuance of that authority he submitted a code to the Secretary of the Treasury, who accorded his approval; and on the 18th of February, 1885, the following system was promulgated by order of the Government:—

ENGINE-ROOM SIGNALS.

1 Whistle or bell	Go ahead.
1 Whistle or bell	Stop.
2 Whistles or bells	Back.
3 Whistles or bells	Check.
1 Long whistle or four bells	Strong.
1 Long whistle or four bells	All right.

Those signals contain all the orders but "half speed." That "half slow" is not in any sense important, and could be always carried out in other ways, but without complicating the code. The signals, it will be observed, may be made with whistles or bells. Electric bells might be made to give one, two, three or four sounds or alarms. The steam whistle, or whistle fixed at the aperture of a pipe in the engine-room, is all that is positively commanded by law on board steamships on the lakes and their tributaries, and the river St. Lawrence. The steam whistle is a fog signal for use on sea-going steamships, and, therefore, its application to the engine-room might create confusion. From a steamship under way a prolonged blast must be made at intervals of not more than two minutes; and the steering rule No. 19 allows one, two or three blasts to be made indicating to starboard, to port, or full speed astern respectively. Steam could be turned on by the officer of the watch and directed to a whistle in the engine-room. This would obviate whistling from the deck, and the bells, also, could be sounded in the same compartment. Signals are made at present, in a great many vessels, by sight, as opposed to sound. The orders appear in letters. When the order is obeyed, a return automatic signal to the master or pilot notifies its execution. The varying systems must be perplexing to pilots. They have to ascertain what method of passing signals to the engineers are used, and then to bear them in memory at a critical moment. Collisions are possibl under such a discordant difference. We recommend, therefore, that a recognized code of engine-room signals be prepared and put into practice.—*Liverpool Journal of Commerce.*

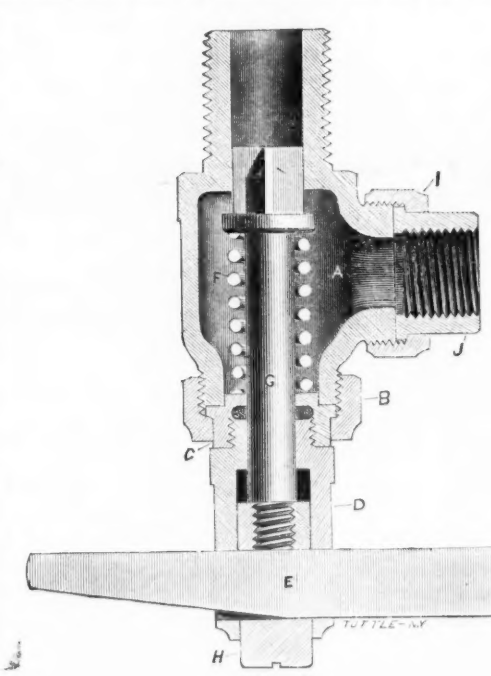


Fig. 1.

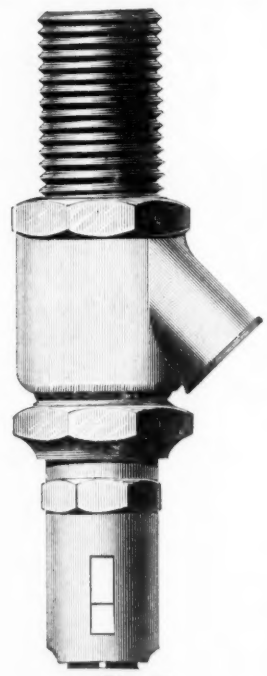


Fig. 2.

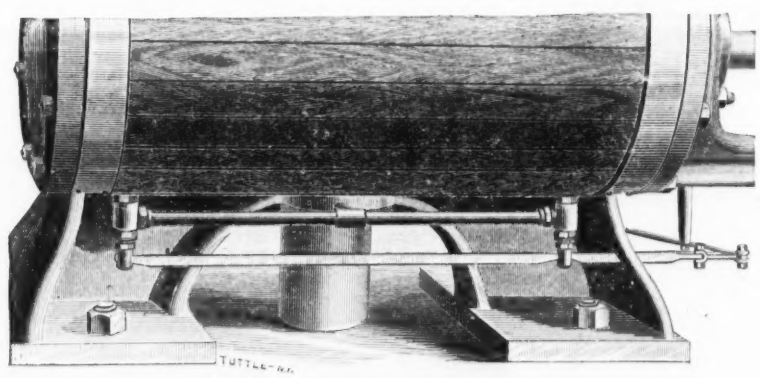


Fig. 3.—Automatic Relief Valve.

Automatic Relief Valve for Steam Cylinders.

The construction of this valve is such that it can be operated as an ordinary cylinder cock, and also such that when closed it will open against the pressure of a spring upon a slight increase of pressure from the presence of water in the cylinder. In cylinders where the clearance is small, it is, with the ordinary cylinder cock, frequently necessary to run for some time with the cocks open. With this cock doing so is avoided, as will be readily understood.

The detail cut shows the construction.

The wedge rod is made with a flat place, partly through plunger *H* and casing *D*, for the purpose of holding valves open, doing away with a special friction device to overcome resistance of spring on wedge, which would have a tendency to close valve.

For land and marine engines, stuffing-box *C* is provided with ordinary packing to prevent leakage, which, for locomotives, is not strictly necessary. Pipe bowl *A* is made to screw into cylinder, provided with a flanged nut *B*, which holds stuffing-box *C* and plunger casing *D* in place. Stuffing-box *C* also acts as a bed for spring *F*, which is set from 20 to 25 pounds above boiler pressure, which holds valve to seat when wedge is drawn back to relieve spring.

All valves are provided with union joints, *I* and *J*, for the purpose of conducting the water into the exhaust or waste-pipes in land engines, and down and out of the side of the boat for marine engines.

To pack and re-pack stuffing-box *C*, in the lower end of the plunger *H* a notch is cut, as shown, in which to insert a screw-driver; the opening wedge is removed and the plunger unscrewed from the stem *G*, and taken out of the plunger casing *D*, which may then also be unscrewed and taken off, when the packing can readily be inserted in the stuffing-box, and the valve and spring will remain in place and at work.

The lower valve of a vertical or marine engine is specially shaped for the purpose of letting the water from the upper valve pass down through.

Locomotive valves are provided with an opening set at an angle of about 45°, Fig. 2; under this opening, and just at the edge of the flanged nut *B*, there is a smaller opening ($\frac{3}{16}$″) for the purpose of draining valves in cold weather, to prevent freezing and damage.

The space occupied by locomotive valves of $\frac{3}{4}$″ opening is but 5″ from jacket; 1″ opening for consolidated engines; 20″ bore; $5\frac{1}{2}$″ total.

They are made in sizes from $\frac{3}{8}$″ to 3″, and for the larger sizes that would be heavy to handle with one hand, an eccentric or compound lever is used, as the case may require.

The engraving, Fig. 3, shows the application to the cylinder of a stationary engine.

These valves are made by Hale G. Robinson, Sandusky, Ohio.

"Getting up Steam" and "The Wheels Moving," are the suggestive head-lines we notice in a daily paper. A little further inspection shows that they apply only to the political machine.

A good many mills are offered for sale in sections of the country where the wheat crop was nearly or quite a failure, this year. Without doubt, some of them are offered for sale solely on that account. We believe that in many instances parties with capital could make money by purchasing the property of the despondents, where the crop failure is the real cause of selling. Parts of the country have little or no wheat this year, where for years a failure has been unknown. Another year will doubtless see plenty of wheat in such sections, and with a cheap mill on his hands prosperity may come his way. Wheat-raising will not be abandoned in such States as Illinois and Missouri on account of one failure.—*American Miller.*

Driving Mechanism of the Duplex-Geared Wind-Mill.

We show with this a sectional engraving of this mechanism to which the following description applies:

No. 1 is the pivot, cast in one piece, and of strong and rigid form. In it the wheel shaft, No. 20, and the vertical shafts, are journaled in finely finished bearings. No. 2 is the tower casting. It is firmly secured in the tower, and has the secondary shaft, that carries the sprocket wheel, journaled in the lower end of it.

The pivot is accurately centered in the tower casting and is provided with anti-friction rolls working on machine-finished bearing surface, and disposed in such a manner as to take the entire weight of the mill and the pressure of the wind against the wheel. No. 21 is the main driving gear, 22 and 23 the driven gears, each of which receive exactly one-half of the power of the mill.

If gear 22 was used alone in connection with 21, there would be a tendency for the mill to swivel to the left when at work, but if 23 was used instead of 22, there would be an equal tendency to swivel to the right under the same circumstances. It is evident, therefore, if both of the gears, 22 and 23, could be used, and each of them bear an equal portion of the strain, the tendency to swivel in one direction would be exactly balanced by the tendency to swivel in the other, and we should have a balanced geared mill.

This is exactly what is done. The gears 22 and 23 bear an equal portion of the strain, and transmit it through their shafts to the gears 24 and 25, which revolve in opposite directions, but their opposite sides move in the same direction and give motion to the gears 27 and 28. These are loose on their shaft, but are connected by a peculiar device, (No. 28), consisting of several small swivel gears on a spider securely keyed to the shaft. This allows them to turn on their shaft in opposite directions, but when they revolve in the same direction the shaft is moved with them. If, when the mill is at work, it swivels on the tower, all tendency to accelerate or retard the machinery is exactly counterbalanced by the gears 26 and 27 turning on their shaft, and thus the speed of the secondary shaft remains uniform with that of the wind wheel. Further, when the mill is out of gear and swivels on the tower, the effect is merely to turn the gears 26 and 27 in opposite directions without moving their shaft, and consequently the driven machinery is not moved. No. 30 is a clutch keyed to the secondary shaft. No. 31 is the sprocket wheel that transmits the power of the mill through the chain belt to the machinery below.

No. 32 is a shifter secured to the tower at 33. This is connected by wires to a similar device within reach of the operator on the ground, and enables him to stop and start the machinery at will without stopping the mill. The pump rod can be attached to the pin at No. 14 and be driven without running the line shaft.

These windmills are made by the Lake City Tool Co., Madison, Wis.

Balancing Rotating Pieces.

By C. L. Redfield.

I will start out by stating two laws of rotation, and then endeavor to prove them.

First Law: *In any rotating piece whose center of gravity does not coincide with its center of suspension, the heavy side may be prominent at any rate of rotation.*

Second Law: *In conditions which will permit of the light side becoming prominent, either the light or heavy side may be made prominent at will.*

The conditions which will admit of the light side becoming prominent are four in number:

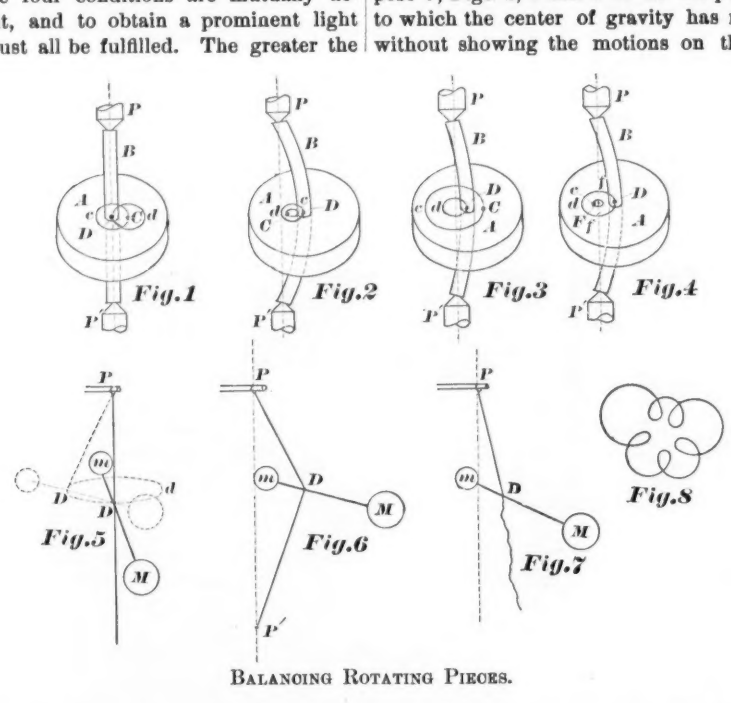
First. The rotating piece must have some considerable weight.

Second. The center of gravity and center of suspension must be relatively near each other.

Third. The shaft must be flexible enough to admit of being sprung a distance greater than the distance between the center of gravity and center of suspension.

Fourth. There must be a sudden or rapid acceleration of speed.

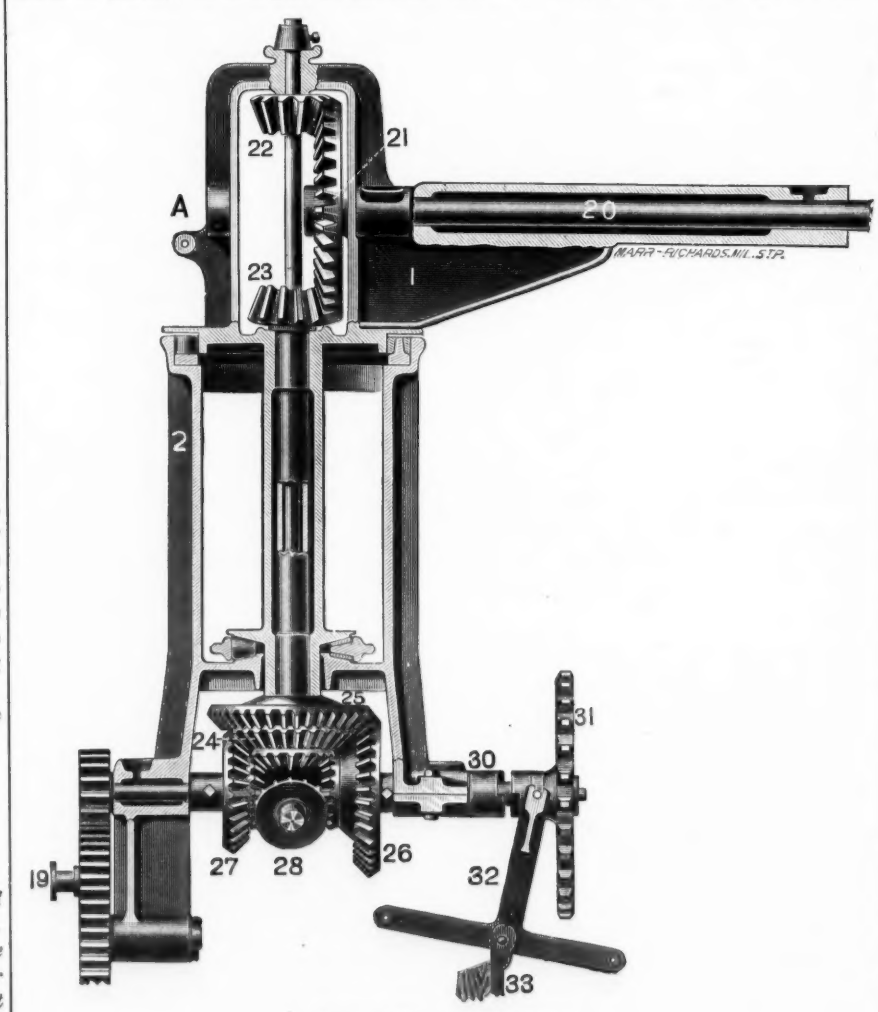
These four conditions are mutually dependent, and to obtain a prominent light side must all be fulfilled. The greater the first, third and fourth, and the less the second, the easier to obtain a prominent light side. The greater all four of them, the more prominent will the light side be. The first is a constant, and the other three are variables, as will appear further on.



Balancing Rotating Pieces.

In Fig. 1, let A be a disk, with its center of gravity at C, and its center of suspension at D on shaft B. In these considerations the shaft B must be included in finding the center of gravity, as it is part of the rotating piece. At rest it will occupy the position shown in Fig 1.

If the shaft be rotated on its centers $P.P'$, the center of gravity C will revolve around D in the circle $C\,c$, and as the speed increases the centrifugal force of the entire mass will throw out from the center of rotation drawing D after it, and C and D will describe the circles shown in Fig. 3. It may be remarked here that the center of gravity is not now at the same place on the disk A that it was in Fig. 1, but has moved nearer D. This is owing to the ends of the shaft B being sprung away from C. In Fig. 2, the ends of the shaft are sprung toward C, and the center of gravity has moved further from D. For convenience, though, we will suppose C, Figs. 2, 3 and 4 to be the positions to which the center of gravity has moved, without showing the motions on the diagrams. When C, Fig. 1, is started to revolve around D in the circle $C\,c$, the inertia of the mass resists this motion, and if, on account of sudden acceleration, this resistance is greater than the resistance of the shaft to deflection, then the point D will be driven around C in the circle $D\,d$. Both points will move, however, in circles whose diameters are inversely as their resistance. These motions will be illustrated by Fig. 2, and the distance that C and D are apart will be the sum of the radii of the two circles. If the accelerating force continues, these two points may be considered as revolving in these two circles, and the light side will be prominent part of the time, and part of the time (a single instant only) there will be no prominence. This will explain the violent shaking of an emery wheel while attaining its speed. As a matter of fact, however, these curves will not be circles, owing to the increased resistance of the shaft B, as it is thrown further from its neutral position, but the curve $D\,d$ will be flattened at D, and as the distance $D\,C$ is a constant (nearly), the side C of the curve $C\,c$ will be correspondingly protuberant. Hence during the first revolution of acceleration the point C is forced toward the center of revolution in direct opposition to the centrifugal force. At each succeeding revolution it will be forced further until finally it reaches the position shown in Fig. 4, in which position it will continue to revolve. It will be seen that the center of gravity is not at the center of revolution, but at some distance from it. This is explained by the deflection of the shaft causing a thrust on the point C.



Duplex-Geared Wind-Mill.

It may be asked that if the shaft forced the center C from the position shown in Figs. 1 and 2, to the position shown in Fig. 4, why will the shaft not force it to the position in Fig. 3? This is explained by the inertia of the body A and the rate of revolution. During the half revolution $f\,D\,f'$, the spring of the shaft is to the left, and during the other half it is in the opposite direction. If the rate of revolution is great, the time that the shaft has to move the mass A is small, and consequently the distance it is moved will be small, before the shaft is on the other side to force it back again. It is obvious that the greater the speed the less the disk will be displaced, and the nearer C will be to F. The more flexible the shaft the less the displacing force, and the greater the mass the less will a given force displace it, and the more prominent will the light side be. If the weight of the mass or the rate of revolution be infinite, C will coincide with F, and the prominence of the light side will be maximum. The same result would obtain if the shaft were perfectly flexible.

Let us suppose the rate of revolution to be slowly decreased, then will C be forced further from F, and the circle $C\,c$ will increase in diameter, while $D\,d$ decreases till the two circles coincide, when, as D no longer goes around on the outside of C, it will have no further power to restrain the centrifugal force, and the disk will be thrown violently into the position of Fig. 3, and the vibration set up in the shaft is illustrated by the shaking of an emery wheel while stopping.

Now for our experiments, which are easily tried, and which will demonstrate the truth of the two laws which I have formulated. Take two weights and suspend them as in Fig. 5, so that they will be out of balance. If, before they are hung up on the pin P, the string be twisted so as to obtain a rotating force, they will, upon letting go of them, gradually assume the position shown in dotted lines, and rotate on their center of gravity, the light weight being prominent.

If, instead of letting them swing freely, the end of the string that hangs down below D be held fast to the floor or a stationary point, so as to give a resistance to deflection of the string, they will, upon being allowed to rotate, assume the position shown in Fig. 6, and the heavy weight will be prominent.

Now, repeat experiment one, and, after the weights have made a few revolutions, stop them, and, without changing the string, try again. After a few trials, the point D, instead of moving in a circle, as in Fig. 5, will describe a series of convolutions similar to Fig. 8. Stop them again and try once more, and they will assume the position shown in Fig. 7, with the heavy weight prominent; and no subsequent trial, without retwisting the string, will make them assume any other position.

The conclusions to be derived from these experiments are quite obvious. The resistance of the string to deflection, due to the gravity of the weights, though a variable, is a constant for any given position, while the resistance of the weights M and m to motion due to inertia varies with their weight and velocity imparted. Thus, in experiment one, the resistance of the weight M to the velocity which would be imparted by the twisted string is greater than the combined resistance of the string and the weight m;

hence the point *D* is forced around the center of gravity, and not the center of gravity around *D*.

In experiment two, the resistance of the string is increased by holding the end of it down, to an amount greater than the difference between *M* and *m*, the result being that the weight *M* and the center of gravity are forced around *D*, and, as the speed increases, the centrifugal force throws *M* further from the center, drawing *D* after it. In experiment three, the resistance of *M* to the diminished velocity imparted by the string is about equal to the resistance of the string and *m*, the result being the irregular curve of Fig. 8. Later, as the accelerating force of the string is less, the resistance of *M* is less than that of the string and *m*, and the center of gravity is slowly forced around *D*, with the final result shown in Fig. 7. It is evident that, this effect once obtained, the accelerating force can be continued indefinitely at will, and hence the first law that the heavy side may be prominent at any rate of rotation.

The second law is really but a corollary to the first.

It may be remarked here that rotation with the light side prominent is the free or natural condition, while rotation with the heavy side prominent is the forced or constrained condition. Rotation about a rigid axis is in the constrained condition, and can never have the light side prominent.

To those who are interested, I would suggest two other experiments: Instead of holding the string down, as in experiment two, hang a weight upon it and note the motion; also, in experiment two, after the weights have acquired a fair rate of revolution, release the string, allowing them to swing freely. I would especially recommend this last experiment to Mr. Ball, as by it he will see that his theory of "sudden release," as an explanation of rotation about the center of gravity, is untenable.

It has been stated that "the reciprocating parts of an engine cannot in any degree be balanced by a counterweight in a rotating piece." Suppose a vertical engine with a double disk crank, with the flush side out, and the counterweight as near the connecting-rod as possible without touching, the reciprocating parts designed on principles previously explained, and the counterweight just sufficient to secure perfect standing balance, and I think that any one familiar with the subject will admit that it is in some degree balanced.

Laying Out Sheet Iron and Boiler Work.

By George Marshall.

FIFTH PAPER.

THE GOOSE-NECK ELBOW.

This, like the ordinary elbow, may be made at any angle desired. It requires a full-sized sketch, as shown in Fig. 1, the outer circle of which may be divided into as many equal parts as may be required, bearing in mind that the more pieces there are the nearer you come to a true curve; also bearing in mind that the more pieces you use the greater the cost.

In this sketch the elbow is divided into five equal parts, all of which are shown; but in the center piece we have an illustration of what the goose neck really is—a straight course, bevel on each side. In the central section the straight course is represented by the lines *B* and *C*, and the bevels *A* to *B* and *C* to *D*. In Fig. 2 we have a view of one section, if the same were rolled up and looking at the edge; this is shown in the half-circle which is divided into equal parts. The same figures also show a view of the same piece rolled up and looking at the side. The lines drawn across are identical with the divisions shown on circle.

Fig. 3 is a view of the developed piece, and the lines *O*, 1, 2, 3, 4, 5, 6, 0, etc., correspond with those shown on Fig. 2; the letters *A*, *B*, *C*, *D*, shown in each figure, refer to the straight course already referred to, and the bevels on each side. They are used when laying out the work as starting pointed from which to measure.

The principle used in laying out this piece, so closely resembles those already illustrated, that many of the readers will be able to develop without instruction, but for such as cannot do so the following explanation is given: The full-sized sketch already referred to, having been made and divided, draw a half-circle equal in diameter to the pipe. Divide this into as many equal parts as you desire, as shown in Fig 2, transfer a section of elbow to the vicinity of half-circle as shown, then draw lines from divisions across the side view of section.

It will be noticed that only one quarter of circle in Fig. 2 is used and numbered.

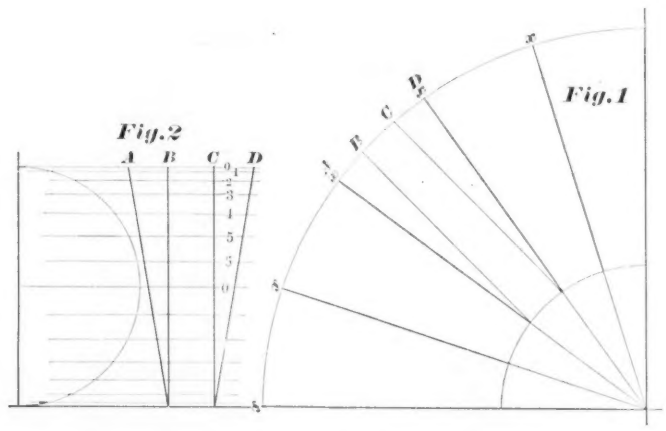
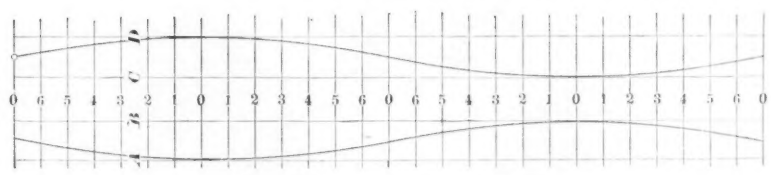


Fig. 3



Laying Out Sheet Iron Work.

The reason for this is explained by measuring from *B* to *A* on any of the lines. At wide end of section transfer your compass to corresponding line on narrow end, measuring from *A* to *B*, and the distance you will find is equal. As a consequence of this when your compass is adjusted you can mark off eight spaces with it, as on lines 1, from *B* to *A* and *C* to *D*, on each side of *O*, and on same numbers on narrow end from *D* to *C* and *A* to *B*. The developed piece, to complete, requires allowance for lap, as the lines shown are the centers of holes.

Having advanced as already directed, measure off on straight sheet the circumference measurement; divide into four equal parts, and each fourth into as many spaces as are shown in quarter-circle. Set compass on line 1 from *B* to *A*, or *C* to *D*, Fig, 2, and transfer distance as already directed to corresponding lines on Fig. 3. Proceed in like manner with other numbers, and your piece will appear as shown in Fig. 3, which is laid out as exactly as though intended to be used for actual work.

Efforts have been made to dispense with large and small courses in the formation of goose-neck elbows, but have not been generally adopted. One of them is based on tapering each piece; this requires too much time at the bench to prove successful. The other is to alter bevels by increasing length on one side and reducing on the other, so that a large and small end may be had on each piece. To an educated eye this elbow looks like a botch job; for this reason, I think, it has not been more generally used.

It will be understood that the finished elbow will not have the exact appearance as shown in Fig. 1, from the fact that the pieces will be straight on top and bottom instead of curved as shown, but the utility of the work is only slightly diminished from this fact.

This piece shown in Fig. 3 has the seam on the side. Joints are broken by placing seams opposite each other on the finished work. If it is desired to place the seam at any other point than that shown, it may be accomplished by changing the numbers on straight sheet; where 6 now is placed substitute 1, and in like manner with the rest of the figures, and the seam will be on top or bottom as desired.

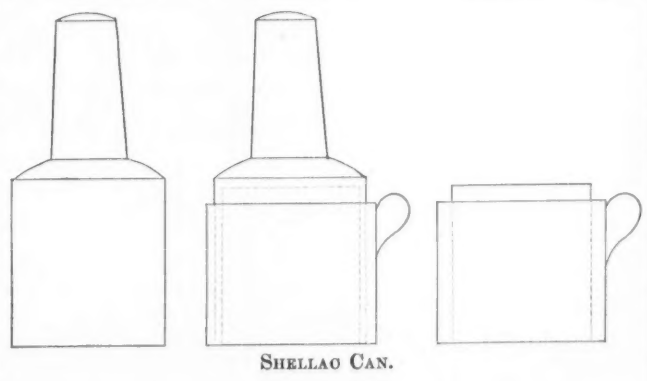
LETTERS FROM PRACTICAL MEN.

Shellac Can.

Editor American Machinist:

I send you, with this, blue print of shellac can which I designed and find very useful in pattern-making. It is nothing more than an ordinary can with a jacket around the outside, into which is poured half an inch or so of water or oil; the cover closing down into this liquid makes it practically air-tight, and never sticks. C. R. Carley.

Syracuse, N. Y.



Shellac Can.

Economical Engine Performance.

Editor American Machinist:

I noticed an article, by Harris Tabor, in a recent issue of the American Machinist on the economy of throttling engines. Perhaps he has a governor that will make them able to compete with a single-valve automatic engine, but if he can make a better record on fuel than one I have in mind, he must have an excellent governor. It is a 4 H.P., estimated to be doing 3 H.P. of work, running about 60 feet of shafting, 1 engine lathe 18″, 1 engine lathe 16″ on 24″ planer, one 20″ upright drill, 1 large grindstone and one 12″ drill lathe. The cost of fuel, after getting up steam on shavings in the morning, is 36 cents for a day's run of 10 hours. As for stillness of running, I never saw an engine fitted with the best throttling governor that could equal it.

As for waste room in cylinder, I could not say, but the distance from valve to cylinder could not be much shorter, as the chest is as long as the cylinder and the ports are at the extreme end of the chest. The shafting was not put in fine condition or any fine watch kept on the engine, thinking to make a record, but an every-day run. As to the workmanship on the engine, it is well made, but no better than it should be—no better than any engine should be if the builders wish to have every one well spoken of that they send out. I think that this kind of an engine will run longer, and with less "tinkering" than some throttling engines at least; and as for regulation, you could not ask for anything better. A jacket on boiler and steam pipe would probably make some improvement, and probably lower the cost of running a little. If any one can do better than this, I would be pleased to hear of it and how he does it. Fair Play.

Experiments With Bolts and Screw Threads.

Editor American Machinist:

In your issue of October 3, there is published a paper, read before the Mining Engineers' Society, by Major Wm. R. King, in which he gives an account of certain experiments which he has made to determine whether or not the present system of bolt threads is correct, and arrives at the conclusion that the pitch is too coarse. He says, in effect: "These questions were definitely settled by having the bolts tested at Watertown, and there was no sign of stripping the threads or bursting the nuts in any case. The fine (12) thread bolt broke with 18½ per cent. more strain than the coarse (standard 6) thread bolt," etc., etc.

Major King is evidently well satisfied with his work, and goes on: "The importance of the result is evident from the fact that a net increase of about 20 per cent. in the strength of bolts can be made by simply using finer threads," etc., etc., and, carried completely away by the greatness of his discovery, exclaims:

"It is certainly a mystery why manufacturers will persist in making coarse threads; and I can only account for it upon the theory that the present scales have been inherited from the coarse blacksmith work of former years, which has been carried into our modern and more refined practice to avoid changing taps and dies."

If Major King is correct in his deductions, then it will certainly be a good thing for Sir Joseph Whitworth and Mr. William Sellers to throw away their old taps and jam plates and have new and more refined ones made upon a system which Major King will no doubt furnish.

Bolt-making is an extremely practical art, and deals with men and materials as we find them, and not as we think they ought to be. A bolt in use may require to be tightened up and slackened a good many times, using a wrench for that purpose, in which case it is found that fine threads are soon worn away; also the use of the wrench requires a sufficient amount of hold upon the nut, otherwise it soon loses its corners and becomes worthless.

The experienced designer of special machinery uses special threads for his work; thus, for steam-hammer fittings finer threads may be used, to prevent them from jarring loose; and for holding the tail-stock of a lathe coarser threads are used, to give them lasting qualities, and to make them easy for unscrewing; this latter quality is important for ordinary bolts.

Again, in rough bolts, the merchant bar iron of which they are made is frequently defective on its outside, and the inside surface of a punched nut is not by any means perfectly cylindrical, and the niceties of mathematical calculation are entirely lost.

All these matters were fully discussed by Sir Joseph Whitworth when he brought out his uniform standard in 1841, and by the committee of the Franklin Institute in 1864, when they established the more simple American standard. They recognized *the superiority of the finer thread for strength*, but regarded that fact as only one part of the problem, and they solved it, not by mathematical calculation, but with their good mechanical judgment, balancing several opposing qualities against each other, and produced a system which, for general service, it would be difficult to excel. Special cases, however, are constantly coming up where we have the privilege of using such threads as we choose, guided by calculations and our ideas of the fitness of things, and it is only upon one of those special cases that Major King's experiment can have any

bearing, viz.: Required, a turned bolt of a high quality of metal, not to be screwed up or unscrewed under strain, but to be carefully pulled apart in a testing machine, and to have the maximum strength with the minimum weight.

I think that Mr. Sellers or Mr. Bement, of the Franklin Institute committee, could to-day solve that problem in spite of their unfortunate inheritance of a lot of old-fashioned taps and dies.

WILLIAM H. HARRISON.

Braintree, Mass.

Shop Foremen.—An Inquiry.

Editor American Machinist:

In "Tangent's" article in your issue of Oct. 3d, he says: "that he likes the life of a foreman much better than jour work," and "that he would hate awfully to get down to hard work again." I had always supposed that a foreman was expected to do *some* hard work, but from his own statement I am led to think that he does but very little, except to receive the "blame from the office," and to entertain the "agents," or to be entertained by them. From my limited experience as a foreman I must say that I can find plenty of hard work to do. Perhaps not in standing at the lathe or planer all day, but in doing the foreman's *proper* work of keeping a lookout over the workmen, seeing that they are attending to their work and doing it properly, so that it will all come out *right* when completed. I consider it a foreman's business, and his alone, to know what each workman has for work to do, to see that he does it in proper time; and especially to see that other work is prepared in advance for him to commence upon *at once*, when the job he is at work upon is completed, so that there may be no waste of time in waiting for his next job.

A foreman should also, by reading the AMERICAN MACHINIST and other mechanical papers, keep himself well posted upon the improved methods of doing his class of work, so that by adopting improvements from time to time, he may not only be able to reduce the cost of production, but by so doing make himself of more value to his employers, thereby gaining an increase of wages for himself. I think a foreman can find plenty of *hard* work in fully attending to his own proper sphere of work.

One word in relation to the treatment of the workmen by the foreman. *Treat them like men*, just as you would wish to be treated if you were to change positions with them, and I can venture to say that in nine cases out of ten, if a man breaks a tool, or spoils a piece of work, that he will come of his own accord and tell you frankly what he had done, and how he had done it, instead of trying to hide it from you by chucking it into the "glory hole," (if you have one in your shop) or out of sight somewhere, before you should find it out. If necessary to censure or reprimand, do so in as kindly a manner as possible, and not by cursing him.

Will some of the readers of the AMERICAN MACHINIST describe through its columns the best style of drill adapted for use in chucking or turret lathes, for first and second cuts in chucking cored holes, from $\frac{1}{2}$" to $1\frac{1}{4}$" in diameter, and from 1" to $4\frac{1}{2}$" in length. By first and second cuts, I mean the first two drills used when the holes are to be finished to size with shell reamers. W. M.

Fitting Keys.

Editor American Machinist:

A writer in the AMERICAN MACHINIST gives a plan for fitting keys, which I do not think it advisable to follow. He says: "The hole in the pulley is a little larger than the shaft." Now, how can a key that is tight on the sides and free top and bottom, prevent a pulley that is bored a little larger than the shaft, from wobbling when in motion, and working itself looser every revolution? From more than twenty years' experience I have concluded that a key ought to fill the hole on the sides as closely as possible, but in order to fasten the piece securely, be it a coupling, crank, pulley or gear wheel, it must be a driving fit top and bottom.

H. E.

Practical Training Desirable.

Editor American Machinist:

A little incident occurred a few days ago during a trip over an Eastern railroad, that was, to say the least, highly suggestive of certain educational features, that should be undertaken at once.

We were going along, apparently all right, when the train suddenly stopped about 100 yards from Whiten's Station; after standing a few minutes a number of the passengers went forward to ascertain the cause of the delay, and found the engineer hard at work under the engine, and the fireman jumping around as lively as possible, under the pressure of excitement and importance at being an actor in the comedy then before the public, bringing tools and oilers until the surroundings had the appearance of a wrecked machine shop.

Fig. 1.

Both were evidently too busy to answer any questions, but after waiting a few moments the hammering under the boiler ceased, the engineer called for more oil, and presently crawled out and stepped up into the cab, to make a trial of his work. Then it became apparent that an eccentric had slipped, and it was also plain that the eccentric was not yet anywhere near its correct position. Just then a freight train came along, going in the opposite direction, and the engineer of our train remarked to the conductor, in a matter-of-course way, that the best thing he could do would be to get the freight engine and hitch on, "and," said he, "you had better get him to push me out of the way first."

This latter was not necessary though, for in a lame, halting sort of way, he managed to side-track his engine, and, the freight engine being attached, tender foremost, towed us safely along.

It is probable that the correct position of eccentric was not marked as plainly as it should be (a thing that is too often neglected entirely), but it could have been set so nearly by the eye as to have answered the purpose until the end of the trip, and then have the setting corrected.

It is strange that a little practical training in matters of this kind, and of dismantling an engine, is not given to engineers by the railroad companies, and the engineers be required to demonstrate to some competent parties their ability to do these things. The outlay would be more than repaid by the saving of time alone in accidents of this nature.

Some few companies have arranged places in their shops, where engineers may be practically instructed in working the air brake; it would pay them to extend the education far enough to be of value in accidents that are of more frequent occurrence than those of the brake.

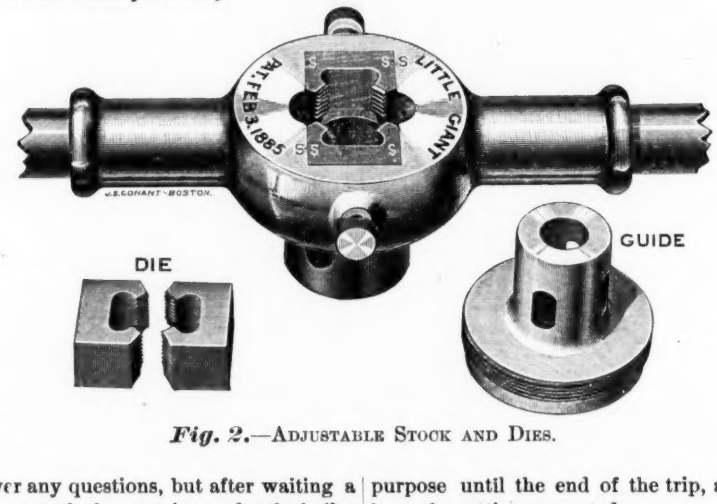
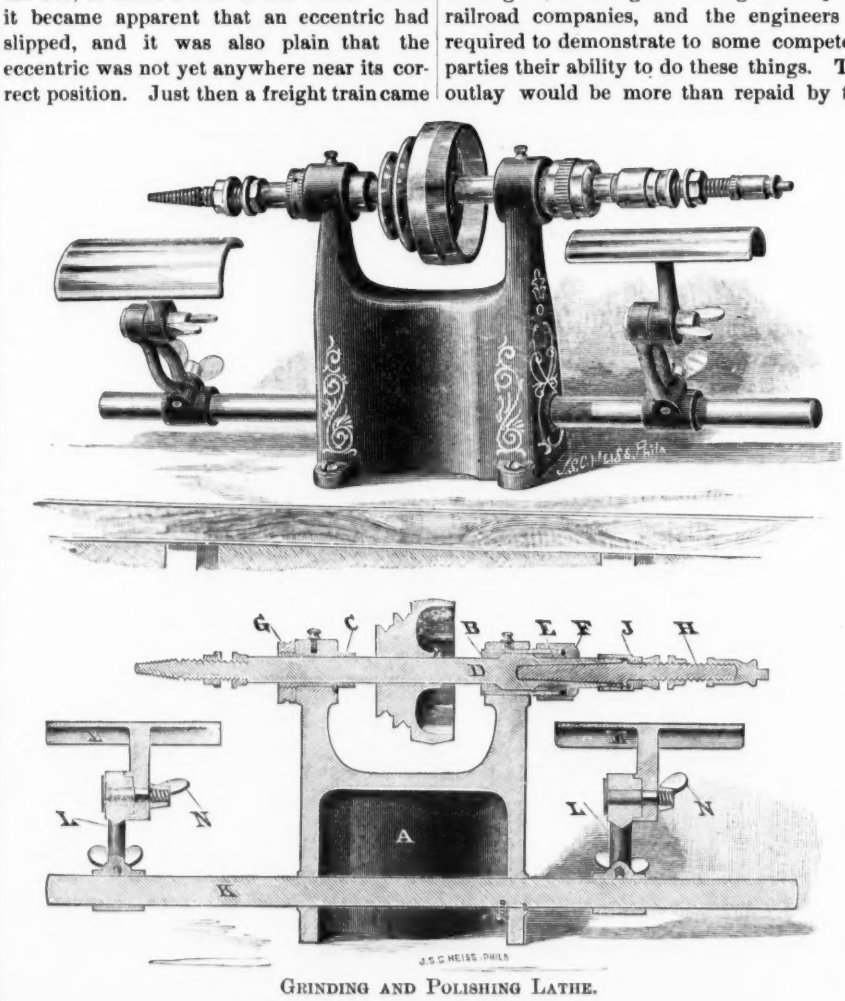


Fig. 2.—ADJUSTABLE STOCK AND DIES.



GRINDING AND POLISHING LATHE.

The natural desire for information undoubtedly leads many engineers to gain this information for themselves, but still there are many (possibly good men as far as running an engine is concerned) who have no inclination to learn, or else are too lazy to trouble themselves, who should be required to pass an examination of the above nature.

As it is from the firemen that the ranks of locomotive engineers are filled, every opportunity should be afforded them to learn the construction and proper condition of an engine, and indeed this should be required of them, so that when an accident takes place they will understand exactly what to do and can act with some reason in the matter. A. G. BROWN.

The "Little Giant" Adjustable Stock and Dies for Pipe.

The manufacturers of these stocks and dies, Wells Bros. & Co., Greenfield, Mass., have for some time used the principle of holding dies for threading bolts by a bevel instead of taper or cup-pointed screws, but have only recently adapted the stocks and dies for cutting pipe threads. The illustrations presented with this represent this adaptation of bevel dies to pipe threading.

Fig. 1 represents the pipe plate complete in case, as furnished. The case makes a place for keeping the parts, insuring their always being together when wanted.

In Fig. 2 detail views are given, from which the construction may be seen. A die and guide are used for each size; to change from one size to another it is only necessary to screw out the guide, let the die drop out, and replace with the required die and guide.

The cap of the stock is beveled, and the die also; these bevels are brought into line by screwing in the guide or check nut, which throws the bevel of the die into the bevel of the stock, square and true. To adjust to cut smaller or larger, turn the thumb-screw at ends of dies in or out, as the case may be.

New Lathe for Grinding and Polishing.

This lathe is designed for grinding and polishing operations on small work of all kinds. It can be instantly adjusted diametrically or laterally, and carries a universal hand-rest for the convenience of the operator. Referring to the sectional cut:

The base *A* is of rectangular form, and carries at each end a column terminating in cylindrical bosses; these bosses are bored to receive the journal boxes, *B* and *C*. These journal boxes are of bronze metal. The box *B* is bored parallel at both ends, but larger at the front end, and leaving at the intersection a cone of 60° angle. The spindle *D* is of steel, unannealed, and is turned to fit boxes *B* and *C*, but with a double cone or cones reversed to each other in box *B*. The sleeve *E* is of steel and made to fit box *B* and spindle *D*, but projecting $\frac{1}{8}$ of an inch beyond the face of box *B*. Cap *F* screws on box *B*, and carries with it sleeve *E*, which brings both cones to a perfect bearing. Journal box *C* is bored parallel to fit spindle *D*, but turned taper on the outside to fit a corresponding taper in the base *A*. *G* is a screw collar which draws box *C* close on spindle *D* as wear takes place. The small slip mandrel *H* fits in the spindle *D*, and is the same taper as the "Lawrence" and United States lathes. All chucks, vulcanite and solder burs fitting those lathes correctly will fit and run perfectly true in this lathe. Screw cap *J* draws slip mandrel up true, and also takes it out without fear of bending.

The rod *K* passes through base *A*, parallel with the spindle *D* and securely fastened, carrying extension arms *L*, which can be fastened at any point required. Pivoted to arms *L* are hand-rest plates *M*, which are clamped by thumb-screws *N*; by aid of this simple combination the hand-rests can be placed in any position, either in front or back of spindle *D*, in which place they answer as a splash guard. Every part of this lathe is made with care and close adjustment. It is neatly japanned and nickel-plated. Three chucks are furnished—two,

plain, for wheels, one screw cone for brushes, etc.

The manufacturer is Matthew H. Fifield, 3015 Chestnut Street, Philadelphia, Pa.

New 20-Inch Upright Drill.

The engraving represents one of the sizes of a new line of upright drills, made by Currier & Snyder, Worcester, Mass. This drill has a continuous wheel-feed of 22 inches and will swing 20 inches, the entire length of the column.

The head has a vertical movement of 22 inches, and the table a vertical movement of 18½ inches. The greatest distance from spindle to base is 50 inches.

The base is 16½ inches wide, 2 inches deep, and is planed square with the column. The head has scraped bearing surface of 10 inches. The spindle is 1⅜ inch diameter, with shank 1¾ inch diameter, the hole being "Morse taper."

The cones are for 2¼ inch belt, and as will be seen are placed well apart to provide for using long belt. The tight and loose pulleys are each 12x3 inches; total weight of machine, 800 lbs. It is a well-made and convenient tool of its kind.

Driving a Bicycle with Steam.

Hundreds of bicyclists and two thousand other persons gathered in the Roseville Rink in Newark, last night, to witness the performance of a steam bicycle invented and exhibited by L. D. Copeland, of Arizona. The bicycle was of the Star pattern, with a small wheel in front, and attached to the front bar was a vertical brass boiler heated with gasoline. A dainty engine was mounted on the bar above the boiler, and had a stroke of three inches, with a cylinder 1 1/16 inches in diameter. Below the engine was a spherical reservoir, holding a quart of water, and above it a cylinder holding as much gasoline. A round belt communicated the power of the engine to a 30-inch wheel attached to the wheel of the bicycle. The engine made 180 revolutions of the 1½-inch crank in a minute, and nine of these revolutions turned the large wheel once. A little steam-gauge showed 60 pounds pressure a few minutes after the fire had been started, and, leaping into the saddle, Mr. Copeland rode swiftly around the rink for twenty minutes. The inventor said the engine would run for an hour without renewal of water or gasoline, and that engine, boiler and fuel did not add more than 20 pounds to the weight of the bicycle. He has retained the pedals on the machine, and he used them as an auxiliary to the engine when he pleased.—*The Sun.*

Porter's Pipe Wrench.

The pipe wrench illustrated herewith, possesses some peculiarities that will recommend it to those who use such tools. It may be used for studs and nuts as well as for pipe. It is self-adjusting for different sizes within its range. To apply it to a pipe, stud or nut, it is only necessary to bear down on the end of the short arm; upon releasing this the spring shown will keep it in contact with the piece, the harder the strain on the lever the stronger the bite. In turning back for a new bite the operation is similar to that of a ratchet.

These wrenches are easily constructed, and, being made entirely of steel, are strong and durable. From their form they may be worked in corners and places where there is small room. They grasp the pipe on three sides, and hence are not likely to crush it. The handles are long, giving ample power for turning. They are made in stock in sizes to take: ⅛″ to ½″; ¼″ to ¾″; ½″ to 1″; ¾″ to 1½″; 1″ to 2″; 1¼″ to 3″; 2″ to 4″; 3″ to 5″, and on special orders to take from 6″ to 12″ pipe.

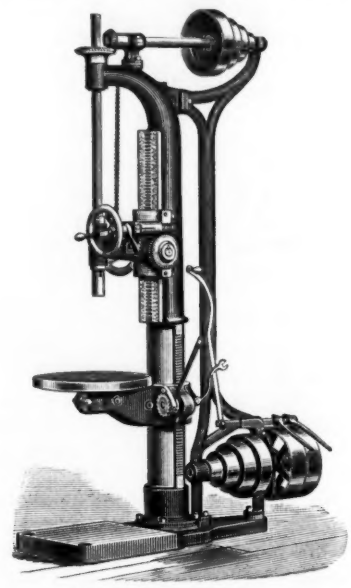
The Eaton, Cole & Burnham Company, 82 Fulton street, New York, are sole agents.

Receipts of English railroads show so far this year considerable falling off, as compared with corresponding times last year.

The Novelties Exhibition at Philadelphia.

A "loose-pulley device," by the Philadelphia Shafting Works, attracts considerable attention. A sleeve attached to a bearing of the main shaft, carries a pulley upon which the belt is shifted when the machine is at rest.

A disk of rubber is compressed between



New Upright Drill.

the tight and loose pulleys by the movement of a lever, and gives motion to the loose pulley.

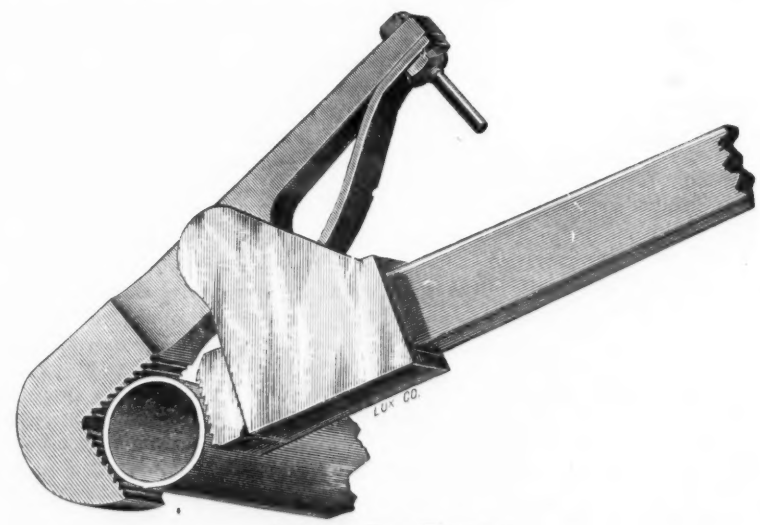
When up to speed, the belt is automatically shifted to the fast pulley, and when the lever is released, the loose pulley stops, and is at rest, together with the belt, when the machine is not in use.

William Sellers & Co., show a novel feed device upon a planer. By throwing over a lever, the platen is started either forward or back, according to the direction the lever is moved. This lever is hollow; through it runs a second lever, which is bent 90 degrees where it leaves the hollow starting lever. This bent lever forms a finger, which indicates the feed. By turning it down from a horizontal position, it starts the feed. When turned up, the planer may be run any length of time to adjust the tool without feeding at all.

Everybody who uses vacuum pans for the concentration of liquids, is well aware of the increased cost of apparatus of large capacity. To double the capacity, we must treble the cost, at least.

The "Yaryan" apparatus, shown at the Novelties Exhibition, has been constructed to obviate this as well as other defects of the vacuum-pan method.

Copper pipes are fed automatically with the liquid to be concentrated, and are surrounded by exhaust steam and its conducting pipes. A vacuum is maintained by the usual pump. A separator chamber prevents frothing, and separates the condensed liquor from the vapor, and both are delivered where desired.



Porter's Pipe Wrench.

Shop Troubles.

By James F. Hobart.

"Tom, what was the trouble between you and young Tinker, yesterday, out there on the erecting floor?"

"O, there was no trouble. We were tapping out the holes for the guide-bar bolts on that 16″×26″ engine. Tinker tapped one hole and got it 'skewing.' When I went for him, he swore it off on to the chap who drilled the holes, and I know the holes are in straight, for I drilled them myself."

"Well, how could Tinker help tapping the holes in plumb, if they were drilled plumb?"

"How could he help it? You had better say how could he do it, for he didn't know how. Now, those bolts are reamed to fit holes in the bars, and in the blocks under them. If the bolts do not go in *exactly* plumb, the bars will be canted until the bolts are sprung.

"Tinker started in the tap and let it go as it pleased—it wasn't started true, and it cut as it was started. If the hole had been deep enough, it would have straightened itself up before it got through, but here the holes are only 1½″ deep."

"How should he do the job, Tom?"

"Do it? Why, man! He should wipe off his taper tap on a piece of waste, and start it in as near right as he can tell by his eye. As soon as it is well caught, he should take off the tap wrench, set his try-square behind the tap and squint by both to see if they are parallel. Next, he must go a quarter around the tap, and try it from that point. Ten to one, it is out of plumb, and he must true it up, by bearing it in the direction it wants to go, and giving it short turns back and forth at the same time. He must look sharp, or he will cut it over too much. It don't require much coaxing to lean that tap one or two degrees.

Fig.2

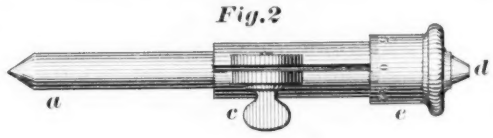


Fig.4

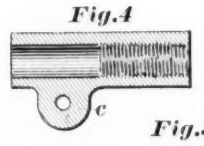
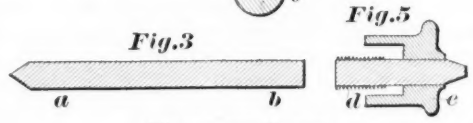


Fig.5

Fig.3



Measuring Gauge.

"We all know how easy it is to make a drill travel into the center of a circle by chipping out a little iron from the side we want it to go to, and it is just as easy to make that tap go where we want it to.

"When Tinker gets down with the taper-tap let him back it out and clean all chips out of the hole with a little iron spoon concern, and start down with his bottoming tap. He will wipe this tap clean before he starts it, and he tries his square on it as soon as it gets to cutting. When that hole is done, it is straight and plumb, that's all you can say about it."

Another chap has trouble in getting the size of a hole. He wants to turn a piece of iron for a forcing fit in that hole. He can take his inside calipers and guess at the size of the hole with them, or he can file up a bit of wire to fit the hole. Perhaps our chap gets out of patience before he gets that wire just right. It is a little too long, so he files off a little, then it is too short, and he must draw it out by hammering, and again file down. By the time this is done, our man has got in a hurry! Now he must allow a little for a forcing fit, and of course he guesses at "a little."

The inspectors of work in a big steam engine shop use a micrometer concern for calipering inside of cylinders.

Some of the machinists have made small tools from the same design, and they are just the thing for inside work. Fig. 2 shows how they are made, and gives the tool life-size. Fig. 3 is a piece of steel wire with the end *a* pointed. At *b* it slides into the body of the tool, shown by Fig 4. Several lengths of wire may be used for any size of hole from 1½″ upward. At *c*, Fig. 4 is a thumb-screw and lugs which clamps *a* in position. Fig 5 shows the micrometer head of the concern in section; *d* is the steel center, which is threaded 40 to the inch, *e* is the brass shell and thumb-piece, and is graduated into 25 parts, giving a reading of $\frac{1}{1000}$ of an inch for each space.

When required for forcing fits, it is very easy to get the exact size of a hole, and then give a draft of .002″, or .003′ as judgment may demand. It beats the old wire business, and the inside calipers, every time.

The shell, Fig 4, which carries the lugs and thumb-screw *c*, is split its entire length and when clamped on the wire *a*, it also fits comfortably on the screw *d*, taking up all lost motion from wear, or poor fitting

New Vessels for the Navy.

The Board of Naval Officers appointed by Secretary Whitney to report plans for construction, recommend the building of one cruiser of steel, 300 feet in length and 49 feet breadth of beam, with a mean load draft of 19 feet, to be propelled by twin screws; speed to be 18 knots an hour. This cruiser, the board advise, shall be armed with one main battery of two 8-inch and six 6-inch rifled cannon; also with another battery of nine Hotchkiss guns and two Gatling guns and complete torpedo outfit. Another cruiser of the same size, it is advised, shall be the same in all respects, with the exception that the main battery shall consist of twelve 6-inch guns.

For the heavily-armored gunboat they recommend a twin-screw vessel of steel, the length to be 230 feet; breadth of beam, 36 feet, with a draft of 14 feet; the speed should be 16 knots. This gunboat, they advise, should be armed with six 6-inch breech-loading rifled cannon, six Hotchkiss guns and one Gatling gun; also a complete torpedo outfit.

For the light gunboat they advise a single screw composite vessel, 165 feet in length; breadth of beam, 31 feet; draft, 11 feet 9 inches; speed to be 12 knots. This vessel should carry four 6-inch breech-loading rifled guns, five Hotchkiss guns and one Gatling gun.

English journals do not give flattering accounts of the iron industries in Britian; the increase of a few weeks since does not seem to keep up. *Engineering* says:

"Some hundreds of hammermen and those associated with them in the mills are now almost out of employment. The hands mostly affected are those who have been engaged in the tyre and axle departments, and a more discouraging outlook never existed. Bands of men, who until recently have had fairly regular employment at iron and steel mills, in the forging departments, are now publicly begging in the thorough fares of this district—a practical but miserable disavowel of the so-called improvements in the local iron and steel industries."

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NEW YORK, OCTOBER 24, 1885.

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Modern Machine Shop Construction.

The old-fashioned machine shop is practically different from the modern-built and modern-equipped shop, aside from the contrasts in the character of machinery used to do the work. Arrangements for heating and ventilating the old shops were generally defective and the workmen had to suffer inconvenience therefrom. The modern shop is heated by overhead pipes or on some other improved plan, and is ventilated so as to keep the air always wholesome. Builders of old-style shops seemed to have a fear that many windows would weaken the structure.

The modern shop has abundant light coming through windows but a very short distance apart, and the walls are made strong enough for the heaviest work required. In the shop of advanced ideas the floors are made extra strong, so that machinery in motion will cause the least vibration possible, for the trouble with springy floors was one of the most annoying in the old-time structures. The frequent breaking of belts and disarrangements of shafting are occurrences incidental mainly to shops built on the ancient plan. Of course the old shop was not erected with the idea of requiring such a thing as a tool-room. This feature stands out prominently in the shop combining ideas of advanced practice. In the typical shop of to-day old-fashioned work benches have given place to the improved style with cast iron frames, which are not lumbered up underneath by a lot of rubbish. Comforts and conveniences for the workmen are increased, such as improved facilities for washing and special sanitary arrangements.

There was no satisfactory way of lighting the old shop for dark days or for night work. Now the electric light illuminates all the dark corners and makes every operation plain to see. Electricity also comes into useful practice in the shop when call bells and signals are required from one department to another, to say nothing of shops large enough to require telephones.

Overhead traveling cranes, swinging cranes and railroad tracks across the floors constitute a part of the modern shop where heavy loads are to be moved.

The modern shop elevator is provided with safeguards against accidents and the hole where it passes through the floor is not left open. Fires are not encouraged by an inflammable style of building and means are provided to promptly extinguish any fire that breaks out.

Formerly it was not an easy matter to arrange a new shop on the most approved plans, but now about every portable improvement is an article of regular manufacture and can be purchased in open market. There are no secrets about the construction of the best shops. Any one desiring to build or make improvements is free to study models and adopt such features as he considers most desirable.

Car-Couplers and Automatic Brakes on Freight Trains.

If the recent tests of automatic car-couplers shall bring about interest enough to induce railroad companies to agree upon the adoption of one or the other of those that were shown to be worthy of adoption, the result will have been entirely satisfactory. These tests showed that several of the couplers operated satisfactorily, and a short trial in actual service would settle all that is now unsettled. The number of men killed or disabled in coupling cars is frightfully large, and public opinion will in the end force the general use of automatic couplers.

It would show more humanity on the part of railroad managers if they moved with reasonable alacrity in the matter, before being compelled to. But we have but little hope of their doing so, unless they are stirred by pecuniary considerations, which is not likely. The history of railroads in this country shows that a consideration for human life, unless it costs something in money, seldom moves railroad corporations to action. Perhaps they are no worse in this respect, however, than other large corporations.

Another thing equally deserving of attention is the use of automatic brakes on freight trains. Between getting squeezed to death coupling cars, and killed from falling off trains over which they must pass, the life of a freight brakeman is considerably less secure than that of a soldier in times of war. Earnest attention to the security of freight trainmen would result in a large saving of life; it is a fair matter for legislative attention.

The average American citizen who does not expect to get appointed to office or to an official position, and whose particular friends are not in such positions or waiting to obtain them, must find certain "leading" daily newspapers very chaffy reading in these autumn days. While there are growing indications of a revival of languishing business, the chief political concern of nearly all business men and workingmen is that the Government shall do nothing to check that revival, if it does nothing to help it. A few sheets that pose as educators of the people, fill column after column with rot and slush about such absorbing questions as which of several specified individuals should enjoy the munificent salary of $3,000 as postmaster of a city in Maine, and which of two individuals shall have the distinguished privilege of drawing $2,500 salary to weigh merchandise in the New York Custom House. A foreigner just arrived in the land might suppose, from reading these papers, that the paramount aspiration of the whole fifty-eight million people of this country is the getting of small official positions, and holding them tightly when obtained. Certainly no foreigner could have had any such experience in reading the "leading" papers of his own country. Politics seem to be running to dregs. Anything for a change would be welcome.

Elevator Inspection.

We have frequently called attention to the fact that more people were killed by elevator accidents than by boiler explosions, and expressed the opinion that there was even more need of regular inspection of elevators than of boilers. At length the authorities in this city have stirred themselves in the matter to the extent of ordering that passenger elevators shall be inspected once each three months. According to the rules to be enforced, manufacturers of elevators must furnish the Superintendent of Buildings a list of the elevators made by them and put into buildings, and shall not permit them to be used until duly inspected. Any person employed to run a passenger elevator shall be over eighteen years old, sober and trustworthy, and shall have had not less than one month's instruction in his duties.

This is all very well, so far as it goes; but, in taking account of passenger elevators only, it stops short of the desired end. Accidents from passenger elevators are of comparatively rare occurrence. It is the ill-constructed, out-of-the-way, uncared-for freight elevator that is dangerous to life; that never receives any attention from any one until it "lets go" some day with disastrous results. It is these elevators that especially need "inspecting," and to which the Bureau of Buildings should have its attention directed. Until this is done, elevator inspection will not amount to much.

Suppose a manufacturer were to make a statement of his last year's business in which he should include all the receipts, but exclude the expenses for water, for repairs and new tools, and interest on cost of plant. Suppose he should present this statement to a prospective purchaser as a record of total cash receipts, and total cash expenditures; what would be thought of such actions when discovered, and how much confidence would the public have in his future statements? Yet this is precisely the kind of statement the New York State Superintendent of Prisons has made to the Legislature and to the people. From its footings he declares a net profit of the State Prisons of over $10,000, while the comparison of actual receipts and expenditures shows that the Prisons cost $61,000 more than was received from them in that year.

Cleanliness in Machine Shops.

So much has been said and written about the importance of keeping machine shops clean that it seems almost a trite subject to take up again. The fact is neatness and order are essential in any building, no matter what occupation is carried on. It is also a fact that these qualities are not duly appreciated. Half the machine shops in the land would be much better for cleaning up and putting things to rights.

It is easy to find shops that vary from a mild degree of dirt and disorder to the downright slovenly shop that never gets cleaned, and where tools never get into their proper places, except by accident. The latter kind of shop is rather a small percentage of the whole, but it furnishes the text for most of the essays on lack of order and cleanliness in machine shops. The owner of such a shop is not influenced by the essays, because he never reads them. He has no interest in mechanical literature of any kind. It is the mildly dirty and semi-disarranged shop that presents the best field for improvement. Its proprietor is not indifferent, and some day when his attention is fairly called to the dirt, he will have it cleaned, and all the tools put into their proper places. When little things that need correction are overlooked, a state of progressive carelessness grows, until it develops into an unpleasant disorder. Keep the floors and benches clean, don't allow piles of chips and turnings to accumulate from day to day, don't let unused small tools lie around promiscuously, don't let the machines in use gum up and gather dust, and don't let the windows get so dirty as to obscure the light. It does not require much effort to keep a shop clean, when the habit is once acquired of not letting it become dirty. The shop-owner who cleans up only by occasional spasms, has a big job whenever he does it. He is like the man who combed his hair but once in two weeks, enduring terrible tortures, and who could not understand how others could pass through the trial of combing their hair every day.

The best work is turned out from the cleanest and most systematic shops. If a shop manager is not particular about keeping things clean, he is not likely to be particular about the workmanship that is allowed to pass through it. The best mechanics always prefer clean and orderly shops, and it takes something more than a slight advance of wages to induce them to change to a dirty shop.

A correspondent sends us a marked copy of a Southern paper containing a glowing item about a member of a manufacturing firm who is now reputed to be worth a quarter million of dollars, and has just bought out his partners. Twenty years ago he was a struggling physician, without means. The item states that "the firm has leased the convict labor of the State for several years past," referring to which our correspondent writes: "This explains how to get rich if you can get there. It didn't get my vote."

Next Meeting of the American Society of Mechanical Engineers.

The American Society of Mechanical Engineers will hold their next meeting at Boston, Mass., beginning November 10. During the time of the meeting a visit will be made to the sewage pumping engines at South Boston; it is also probable that an excursion will be made to Lawrence, Mass., for the inspection of the Leavitt pumping engines, and the Pacific Mills. From what is already known, it is probable that papers of more than usual importance will be presented at this meeting. This is the first meeting of the Society at Boston, and we feel assured that the members will be heartily welcomed by the citizens generally.

There are in Boston and vicinity many places of interest, including manufacturing establishments, at which the members will doubtless be well received. It is hoped and expected that the attendance will be large, including nearly all Eastern and many Western members. We have not at present a list of the papers, or the programme of the meeting.

The recent explosion of the mud drum under a battery of boilers at Pittsburgh, by which nearly twenty persons were injured, several of them fatally, is another warning against the use of a mud drum. If boilers are properly constructed, there is no need of it, and experience has time and again shown it to be the most dangerous and treacherous part of a boiler. In this instance, the material of the mud drum had become corroded until the only wonder was that it held together at all. The mud drum ought to go.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(294) **A. H. G., St. Louis, Mo., will find** an illustrated article on lining up shafting in the American Machinist of Nov. 1, 1879.

(295) **W. W., Hartford, Conn., asks:** In making plug and ring gauges, is it best to use machinery steel and case-harden it, or to use tool steel and harden throughout? *A.*—Make them of best cast steel that will harden throughout.

(296) **E. A., Hyde Park, Mass., asks:** What is the angle of the English standard center-gauge, also the angle for thread cutting? *A.*—The angle for the Whitworth thread is 55°; we do not think there is any standard for lathe centers at least not more so than in this country.

(297) **J. B., Ottawa, writes: I intend** building a tug for saw-logs, for convenience the engine to be horizontal, lengthwise in the boat, the engine to drive a propeller. The engine is to be a compound, 14″×26″×18″; boiler pressure, 100 lbs. What would be best to transmit the power to propeller-shaft, worm gearing or miter gearing, and what would be the loss from friction by rough teeth and by cut teeth? *A.*—We should say miter gears or bevel gears would be the better. We do not see how you will get speed of shaft by worm gearing. We cannot tell what the loss by friction would be; not very great with miter or bevel gears, if well designed, whether the teeth are cast or cut. The friction of worm gearing would be much greater than miter or bevel. Either way of connecting is bad as compared with a vertical engine, direct-connected.

(298) **Q. A., New York, asks: 1. Suppose** my engine is 24″ stroke, and steam is cut off at half stroke, what is the expansion? *A.*—2 + 1 = 2, that is, the expansion is two-fold. 2. You do not give size of the two cylinders for compound engine, hence no answer can be given to this question. 3. What is the meaning of the term re-evaporation? *A.*—When steam is condensed in the first part of the stroke of the piston, and the resulting water evaporated later in the stroke. 4. What is meant by back-lash? *A.*—This term is usually applied to gearing, and is the reaction or striking back of the teeth on the sides opposite the working sides. We cannot undertake to name the cities and towns in the United States in which a license to run engines is required. If you will give full address (street and number), and repeat your other request, it will be attended to by mail.

(299) **A. R. F., Savannah, Ga., asks: Is** it practicable to force water through ¾″ or 1″ pipe vertically to a height of 150 to 160 feet with a hand force-pump, and if so, what should be the arrangement of checks, size of pump for each size pipe, about what labor would it take to operate pumps, and how much water would be raised per minute? *A.*—It is perfectly practicable, but it would be decidedly hard work, if well followed. One man would work a common plunger pump, say 1¼″ diameter and 6″ stroke, and could pump two or three gallons per minute, for a short time. All the valves required would be one in the suction pipe and one in the delivery pipe. Dealers in pumps will furnish you with a double-plunger pump, worked by two men, something like a hand fire-engine, that would probably be more satisfactory. If you want to raise much water to that height, you can do it much cheaper by some of the small power-pumps made.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

T. M. Parker, Steel Stamps, Stencils, Hart'f'd, Ct.

J. Clayton, Air Compressors, Rock Drills 43 Dey st, NY

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co, Bridgeton, N J.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Pat. Att'y; Pat Expert; Mach. Designer; Details prepared W. H. Weightman, 82 Astor House, N.Y.

Consulting Engineer and Mechanical Expert, C. C. Hill, 84 Market st., Chicago, Ill.

Tack, Wire, and Shoe Nail Machinery; Wm. A. Sweetser, Brockton, Mass.

Treatise on gear teeth and bevel gears; specimen pp free. Geo. B. Grant, 66 Beverly st., Boston, Mass

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st, New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Improved Labor-Saving Upright Drills: prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Drop presses, and other special tools, manufactured by Williams, White & Co, Moline, Ill.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Oct 10 p. 14. Send for circular No. 17, Curtis Reg Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the Am. Machinist each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Kellam's Pressure Regulator—used in heating system of 11-story building, Madison ave., N. Y.,—saved, last season, $2,000 over previous season Hine & Robertson, 12 Cortlandt street, New York.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters" Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent on orders for five or more copies

Manufactures

Oliver Weiser and J. E. DuBois will erect a chain factory at Birmingham, Ala.

The Altamaha cotton mill, Company Shops, N. C., will put in additional machinery.

The Lake City Tool Co., Madison, Wis., are making considerable additions to their works.

The Berlin Lumber Company contemplates building a large saw and flouring mill in Dalton, N. H.

The Houston Mills, Akron, Ohio, contemplate erecting a foundry and machine shop at Dayton, Ohio.

John S. Garber, Sangersville, Va., will add more machinery to increase his output of spokes and handles

The Rockaway Mfg. Co is a new concern, which proposes to manufacture bicycles and tricycles at Rockaway, N. J.

Ockford & Dow will convert the old tannery building at Lowville, N. Y., into a foundry and machine shop.

A fire in the machine shops of the Grand Tower Railroad, at Mount Carbon, Ill., caused damage to the extent of $9,000.

The Steel Wire Belt and Hose Company, just incorporated, with a capital of $300,000, will erect a factory in Camden, N. J.

R. E. Moss, State and Michigan streets, Chicago, will build a $30,000 manufactory at that location. It will be six stories high.

The Milwaukee co-operative plumbers have beaten their late employers in taking the contract for school-house plumbing.

Ostling & Bourgeois have completed plans for a six-story factory building for O J. Nilson, on Wells street, Chicago, to cost $18,000.

Forbes & Curtis, Bridgeport, Conn., have issued a new illustrated circular of their line of pipe-cutting and threading tools, ratchet drills, cutting-off machines, etc.

John Aspinwall, who purchased the Mobile Cotton Mill, Mobile, Ala., last May, repaired the machinery and started up the mill in July, expects to add more machinery.

The Lookout Rolling Mill Co., Chattanooga, Tenn., has been organized by A. M. Johnson and others, with a capital stock of $100,000, for the manufacture of steel.

There are now 353 cotton mills in the South, with 1,640,697 spindles and 27,904 looms, against 180 mills, 713,989 spindles and 15,222 looms in 1880. The increase has been 173 mills, 746,708 spindles and 11,782 looms.

The underwear mill at Saccarappa, Me., has been leased, and will shortly be occupied by A. E. Towne & Co., who will engage in a business that will employ a large number of hands, and disburse $3,000 per month in wages.

The Ball Engine Company, of this city, have received notice that the commissioners of awards at the New Orleans Exposition had given them the highest award for an automatic high speed engine. *Erie (Pa.) Herald.*

The Egan Company, Cincinnati, Ohio, has issued a new and very complete catalogue of the woodworking machinery manufactured by them, including, also, shafting, hangers and pulleys. It is a large book of 160 pages, profusely illustrated.

A new association, composed of the firm of Moody, Estabrook & Andersons, of Nashua, N. H., and others, will build a shoe factory, four stories, with wing, at Nashua. Buildings will be of brick, and fire-proof. Estimated cost, $40,000 to $50,000.

According to the *Industrial World*, a new steel casting plant will soon be started in Chicago. The interested parties are W. S. Brewster, Arthur Pierce and others. The works will be known as the Riverside Steel Casting Company, and will have a capital of $200,000.

F. A. Howard, Belfast, Me., has erected a new machine shop, which he will fit up with new boilers and engine and new machinery. The building is 77x34 feet and two stories high. He intends to add machinery from time to time for the manufacture of screw-drivers.

The Variety Iron Works Co., formerly doing business under the same title, Cleveland, Ohio, has been incorporated to manufacture boilers, etc. Capital stock, $200,000. Corporators, T. M. Pitkin, F. L. Chamberlin, O. T. Clay, W. C. Bolles and Jno. P. McGuire, Cleveland.

Warden & Mitchell, Germantown Junction, Philadelphia, have recently added to their existing equipment for doing boiler, tank and gas-holder work, a Niles plate planer, a new flanging machine, and a Morgan 10-ton traveling crane. They now employ about 40 men.

Articles of association have been filed by the St. Croix Elevator Co, of New Richmond, Wis., the capital stock being $25,000. The object is to construct and operate elevators on the lines of the Wisconsin Central, and the St. Paul, Minneapolis & Omaha Railway Companies—*U. S. Miller.*

Water-works machinery will probably be wanted at Camden, Cal.; Little Falls, N. Y.; Dickson City, Pa.; Grand Island, Neb.: Farnham, Ind.; Valley Falls, N. Y.; Bristol, Tenn; Leechburgh, Pa; Mankato, Minn.; Phenix, R. I.; South Bethlehem, Pa.; Arkansas City, Kan, and Shelbyville, Ind.—*Iron Trade Review.*

The Miller Manufacturing Company, recently incorporated at Canton, Ohio, is composed of some of the members of the Miller Company, assigned. For the present they will occupy the shops at Canton, Ohio, formerly occupied by the Miller Company. The new company will manufacture the same goods—steam pumps and roller flouring mills.

The Westinghouse Machine Co., Pittsburgh, Pa., has issued a catalogue of some of the applications of the Westinghouse automatic engine in railroad practice, for pumping, ventilation, electric lighting, and for various special purposes. The illustrations and printing are equal to anything produced in their line, and the matter is worthy of the attention of engineers and mechanics.

James E. Hotchkiss, 86 John street, New York, has just issued the 14th edition of "How to Keep Boilers Clean," making 70,000 of the book issued. The book is descriptive of his Mechanical Boiler Cleaner, but contains valuable information for engineers, besides. It is sent free. In the present edition we notice a statement from parties who have successfully used the boiler cleaner on a boiler 50 feet in length.

At the Capron Satinet Mill, Uxbridge, Mass., which has been idle since January, 1880, a force of workmen are employed, under supervision of D. Mowry Lee, in building a coffer-dam, to be followed by a chimney and boiler-house. A new engine, with other repairs completed or under way, is expected to put the establishment in running order by December 1. The Uxbridge Woolen Mills, which have been idle two years or more, are likely to resume work before January 1.

There is being built at the Chicago Die and Machine Works a new file-cutting machine, the patent for which has just been issued to H. F. W. Liebman, of Chicago. In this machine the file-blank rests on a platform or table, the chisel is brought down to the file and given a blow by the hammer, and this process is repeated automatically, the chisel and hammer being raised sufficiently. The movement is by hand.—*The Industrial World.*

The Watertown Spring Wagon Company, Watertown, N. Y., will erect a 4-story brick addition to their factory. Estimated cost, $12,000.

The Wytheville, Va., *Enterprise*, of September 19, says: "Thomas Breen, of Knowlton, Pa., has bought 18,000 acres of land in Bland County, Va., for the Breen Steel Coke and Composite Brass Manufacturing Co., which will erect a plant near the mouth of Hunting Camp Creek, at the end of the branch road of the Virginia & Kentucky Railroad, which is to be built to that point. The plant is to be erected at a cost of $2 250,000, and will be able to turn out 100,000 tons of material annually. Its manufactures will consist of steel rails, car wheels and composite brass."

The Brown & Sharpe Manufacturing Co., Providence, R.I., have issued a new and enlarged edition of their famous "blue" catalogue. It contains illustrations and descriptions of many new tools. The catalogue is somewhat differently arranged from previous ones, in reference to which they say: "Owing to the increased number and variety of machines we now manufacture, we have decided to use numbers in the place of names, as heretofore. This, we think, will be found more convenient and satisfactory. On page 46 is an index, giving the old name of each machine, with its present number."

The Merrill & Houston Iron Works, Beloit, Wis., who made an assignment two years ago, and have since remained idle, have recently been leased by a stock company composed of practical mechanics, who were formerly in the employ of the Merrill & Houston Co., and started under the name of the Beloit Iron Works. This is considered one of the largest iron works plants in Wisconsin. They manufacture steam dryers and rolls, chilled and gray iron calenders, and general paper-mill machinery. Their foundry will soon be in full operation, their castings at present being made in the foundry of the Eclipse Wind Engine Company.

A marked improvement in trade is visible, and there are few or no power-looms idle in Philadelphia. This is particularly true of the machinery engaged on fine carpets. Prices of carpets remain firm, and have been stiffened a trifle by the advance at the last Liverpool sales of carpet wools. Domestic carpet wools are also up in price. Manufacturers of Smyrna rugs have decreased their discounts five per cent. The retail carpet trade is opening well in the West, and more carpets than usual have been ordered from the South. There are no labor disturbances in the carpet industry. The demand for upholstery fabrics is like to that of carpets.—*Philadelphia Carpet Trade.*

The Virginias, for September, speaking of manufacturing in West Virginia, says: "The New River region needs a great many more coke ovens, and capital invested there now in coke-making will meet very handsome returns, even at present prices. The time has come when coke-making should be there made a special industry, so that not only an abundant supply of coke can be had to meet all demands for it, but so that coke of a uniform grade and of a high standard of excellence can always be had, which can only be the case where coke-making is followed as a distinct business, and not as a mere adjunct to the coal trade, as it now is.

The Eclipse Wind Engine Company, Beloit, Wis, are doing a good business with their Hill clutch pulley. They are building a special department: 70x60, in their new works, exclusively for fitting up these pulleys. They have recently furnished the Washburn Mill Co., Minneapolis, Minn., with one 60″x12″, two 46″x8″, one 20″x10″ clutch pulleys. It is claimed that these are the largest flouring mills in the world. Penn Mather Electric Co., Philadelphia, Pa., one 30½″x8″; Gautier Steel Department, Cambria Iron Co, Johnstown, Pa., 38″x12″; P. C. Pierce, Belfast, Me., two 16″x4½″; Payne Lumber Co, Oshkosh, Wis., one 47″x8″; Pray Manufacturing Company, Minneapolis, Minn., one 10′x37″, capacity, 500 horse-power at 200 revolutions; Stouts & Co., Mobile, Ala, one 7″x2″; Mariposa Rice Co., one 38″x14″; 12 of these pulleys have been shipped to firms in New Orleans, and a number of smaller ones throughout the States. The number of inquiries received in regard to these pulleys indicates a prosperous business.

John Q. Maynard, 12 Cortlandt street, New York, is placing the Victor Caloric Engine on the market. This engine is designed as a pumping engine, or for a motor where light power is required. It is essentially an upright double-crank engine. The piston chamber is closed at the bottom by a dome-shaped heater, and the upper portion is surrounded by a water-jacket. The lower part is surrounded by asbestos cement, and has a lining of asbestos cloth; this retains the heat, and is practicably indestructible. In the piston chamber there are two working parts, the main piston and the regenerating piston, working below the main piston; ring packing is used, with no leather to burn out. The two cranks are set at an angle of ninety degrees apart, with connecting-rods to the two pistons. The flame strikes directly against the top of the under side of the heater, the products of combustion passing off through a small chimney. As the lower or regenerating piston comes down over the top of the heater, the air is compressed against a red-hot surface, and, of course, is expanded by the heat. This drives the lower piston upward. The force is imparted to each piston in turn, the pistons alternately approaching and receding from each other, the air being used over and over. Either gas or kerosene oil is used as fuel. The engine runs at high speed (250 revolutions per minute).

Jacob Berdler, 148 W. Washington street, Chicago, will erect a large manufacturing establishment.

The F. R. & N. R. R. and others are building a new cotton compress at Columbus, Ga.

The cost of manufacturing steel by the Clapp-Griffiths process is said to be $5.50 per ton, besides the cost of the pig iron.

John Graham, manufacturer of trimmings, 354 W. 33d street New York, will build a six-story factory on West 35th street, to cost $17,000.

The axe and hatchet factory of W. C. Kelly & Co., 2220 Portland ave., Louisville, Ky., recently destroyed by fire, will be rebuilt soon. The forge shops will be frame and corrugated iron, and the other buildings will be of brick, with corrugated iron roof. Estimated cost, $50,000.

An automatic injector is exhibited at the "Novelties Exhibition" by the Rue Manufacturing Company, 904 Filbert street, Philadelphia. All starting levers are done away with in this injector. It may be stopped by shutting off either delivery, steam or water-pipe, and will start at once when the closed pipe is again opened.

The "New Pulsometer" steam pumps, shown by T. E. Winebrener, 110 N. Fourth street, Philadelphia, at the Novelties Exhibition, are attracting considerable attention, as also is the fact that these pumps will pump boiling water or other hot liquids. The new style air valve, which does away with jamb nuts is also shown.

An Indianapolis manufacturer is turning out log wagons for service in the mahogany woods of South America. Each weighs 2,500 pounds, and is up to a ten-ton load on a rough road; the wheels have tires four inches wide, one inch thick, and the motive power will be ox teams of from eight to twenty yoke.—*The Furniture Worker.*

The *National Labor Tribune*, of Pittsburgh, says, in its issue of Sept. 26: "There is now but one mill idle in Pittsburgh—the old Sawmill Run works of 17 puddling furnaces. In the old Pennsylvania forge three scrap furnaces are in use and 14 puddling furnaces are idle about all the time, making now, in all, 31 furnaces not lighted, whereas the corresponding time last year there were 165 puddling furnaces idle, and off and on up to July 1 there were as many as 185 idle, beside nearly 100 that are now on double, which were for more than a year on six heats. Including the railroad rail output at the Carnegie Bros & Co.'s steel mill at Braddocks, the daily amount will reach nearly 2,100 tons. This, compared with the metal output, which is 1375 tons a day, shows that fully 750 tons more pig iron is used than is made in Allegheny county. The output in muck bars may possibly be increased to about 125 tons over the present run. But if the volume continues to increase as it has within the last sixty days it will not be long until 2,000 tons of merchant iron will be made in the iron mills alone in this city.

Machinists' Supplies and Iron.

NEW YORK, Oct. 8, 1885

The condition of the supply business is substantially the same as last week, dealers being confident of holding the ground gained. There is as yet no move in the direction of an advance in prices, but there is a universal feeling that this must come. If profits were fairly good, business would be comparatively satisfactory, as complaint is more against low prices than the amount of sales. Manufacturers, on the whole, report considerable increase in business, but make the same complaint of low prices as the dealers. It is beyond question that trade in general has substantially improved, and where this has not as yet materially affected iron and metal industries, it must do so soon.

Iron—There has been a fair demand for American pig, especially for medium brands. Although sales of the better brands have not been equal to those of medium, the former are still held firm. There have been large offers at slight concessions in prices, but dealers are not disposed to yield. We quote No. 1 X Foundry, $18 to $18 50 for standard brands; No. 2 X Foundry, $16 to $16.50; Grey Forge, $13.50 to $14.50.

Scotch Pig—There has been but few transactions in Scotch brands of iron, and those of a trifling character. We quote Coltness, $19.50 to $20; Glengarnock, $18 50 to $19; Gartsherrie, $19 to $19.50; Summerlee, $19 to $19.50; Eglinton, $17 50 to $18; Langloan, $19.50; Daimellington, $18 to $18.25.

Lead is held at 4¼c. for common pig, but there are few buyers at this figure.

Copper—Transactions in copper have been unusually light. There has been but little demand, and the offerings have been correspondingly light. Lake is held at 11c. to 11½c.; other brands, 10c. to 10⅝c.

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Wanted—Situation as superintendent of iron foundry. Address Supt. Iron Foundry, AM. MACHINIST.

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Situation as foreman of machine shop; good references given. Address Buckeye, AM. MACHINIST.

Boy of 17 desires to learn machinist trade; New York or Jersey City; strong and willing; small wages. Address E., AM. MACHINIST.

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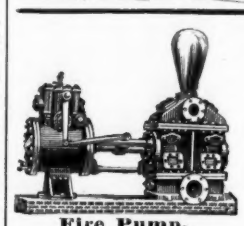

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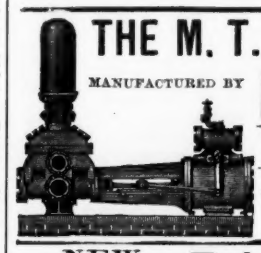

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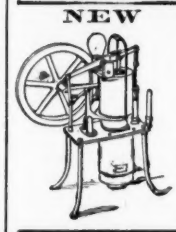

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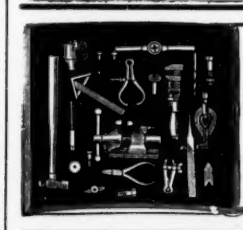

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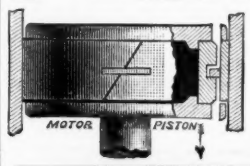

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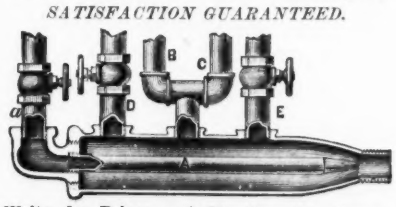

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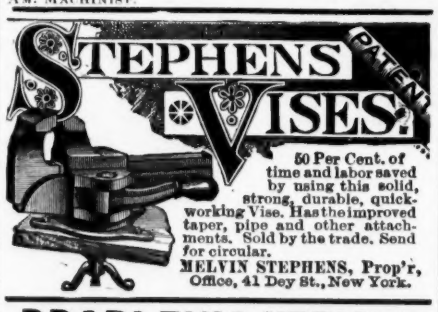

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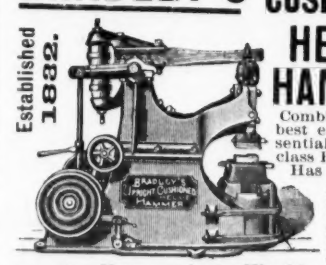

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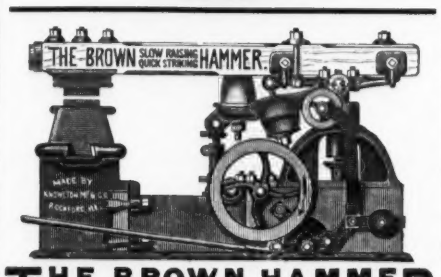

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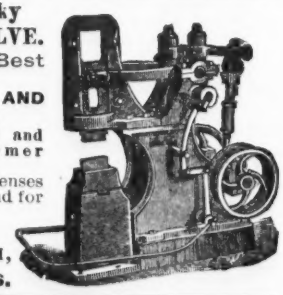

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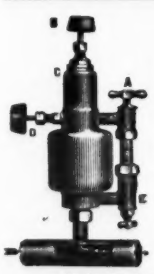

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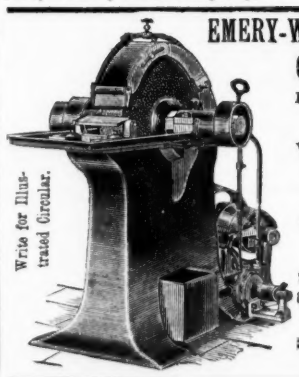

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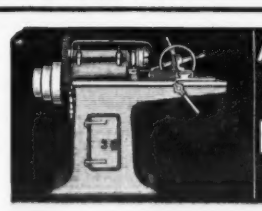

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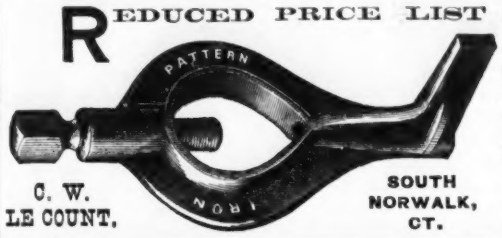

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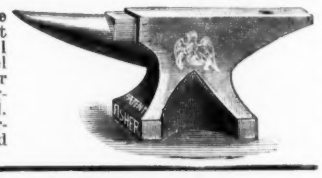

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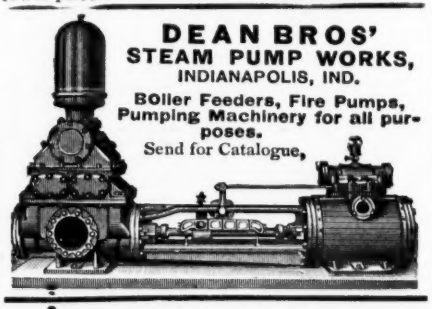

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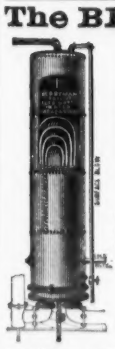

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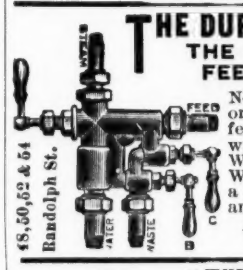

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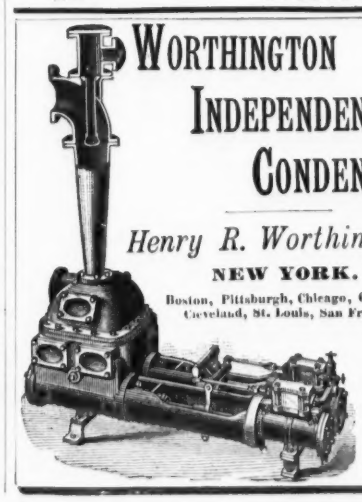

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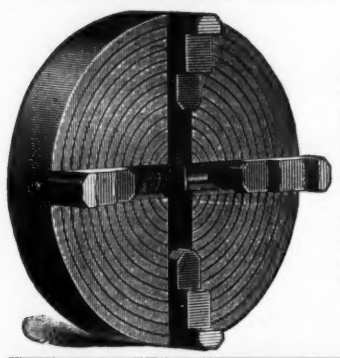

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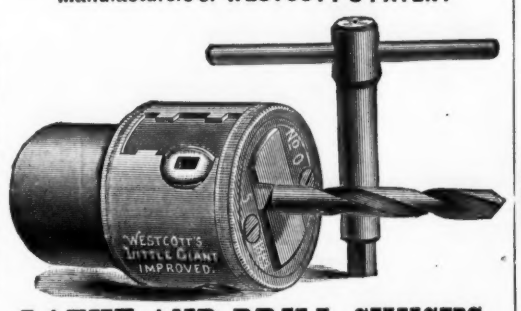

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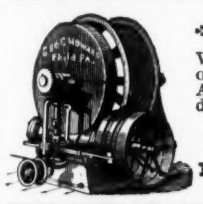

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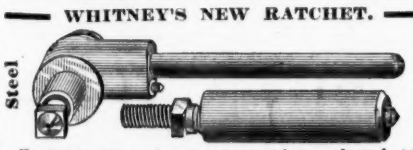

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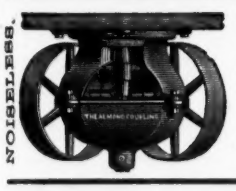

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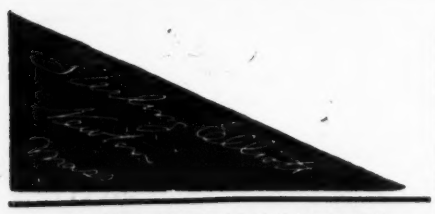

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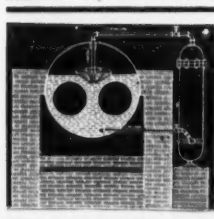

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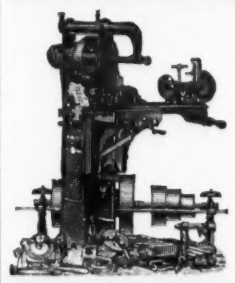

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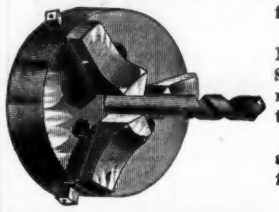

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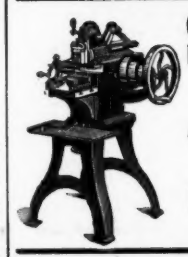

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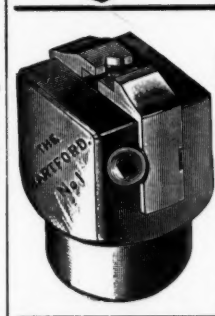

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NOTICE.

Week before last we published, under this heading, references to a small portion of the practical articles that have been specially prepared for the AMERICAN MACHINIST, and have appeared in our columns during the last few months. Last week we published an additional list. We append another list below. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

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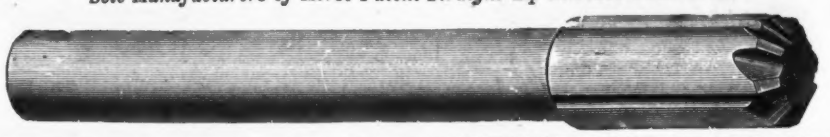

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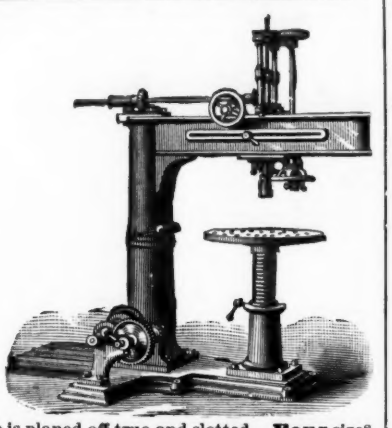

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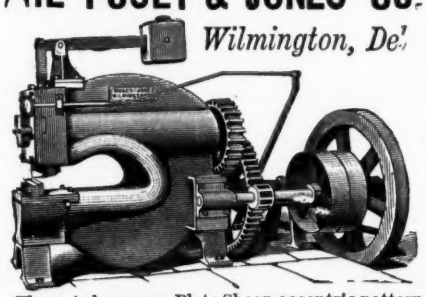

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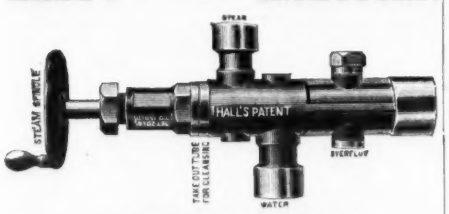

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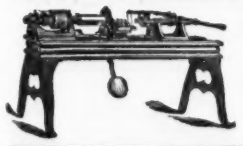

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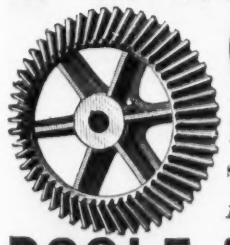

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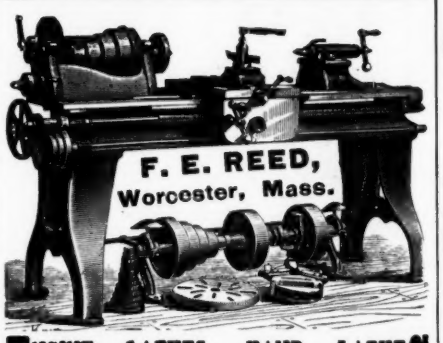

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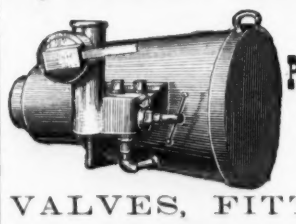

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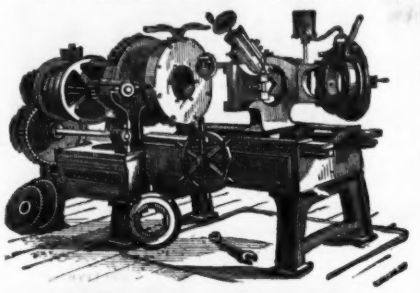

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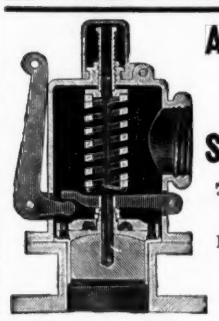

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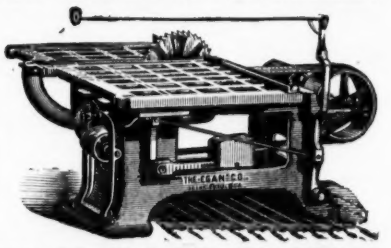

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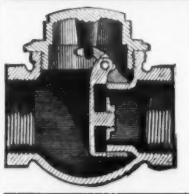

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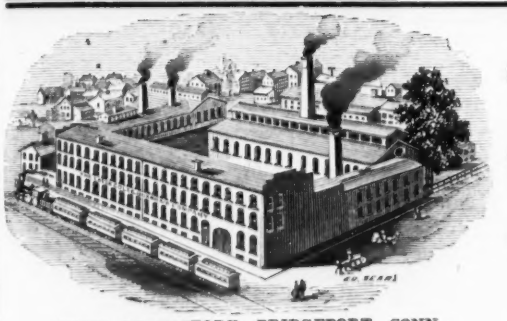

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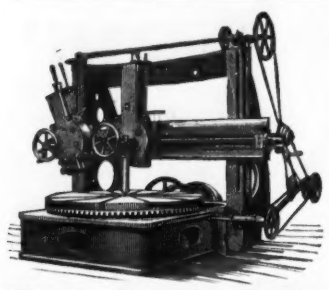

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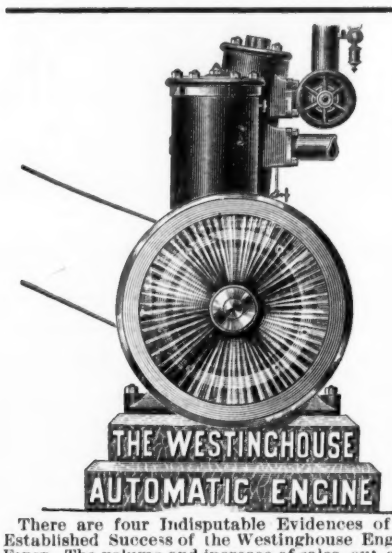

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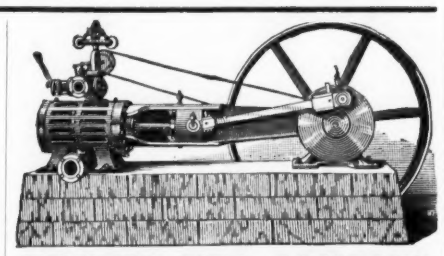

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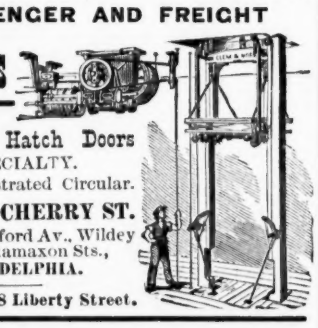

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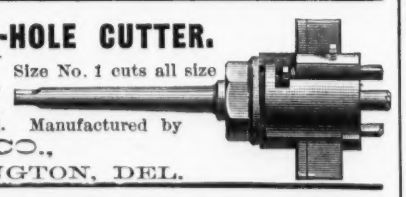

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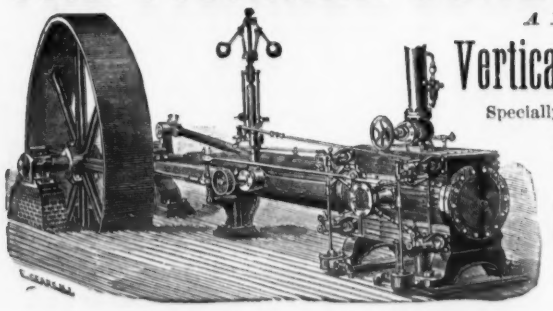

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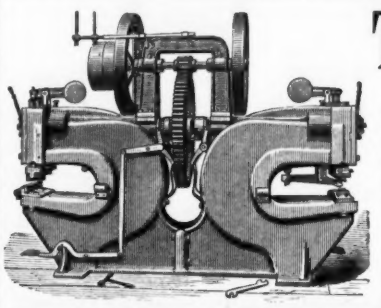

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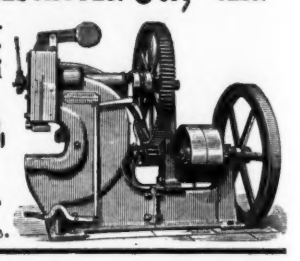

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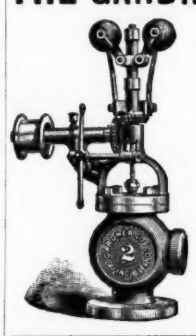

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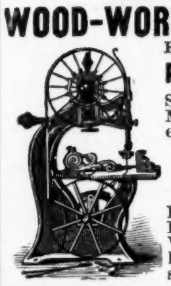

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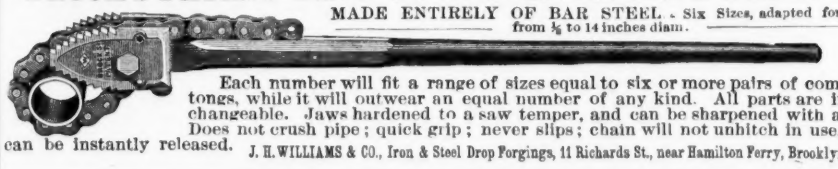

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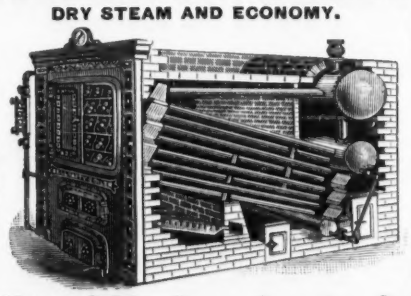

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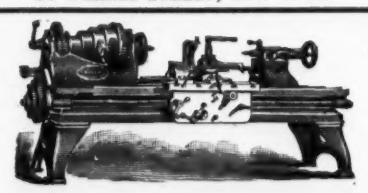

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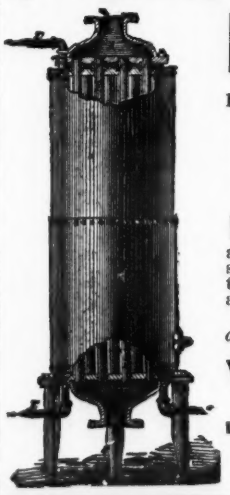

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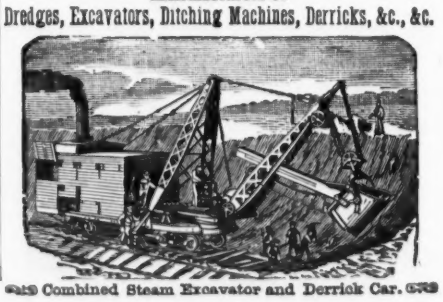

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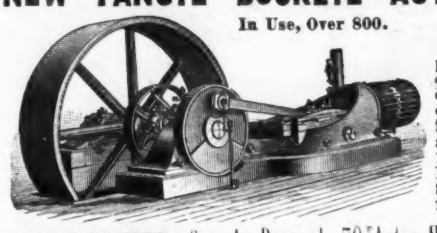

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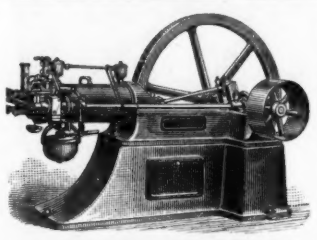

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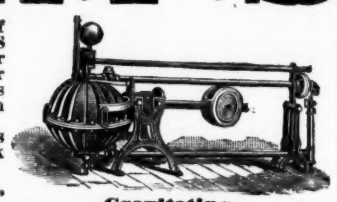

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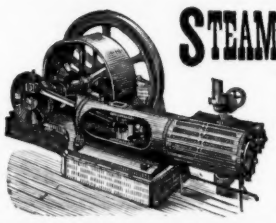

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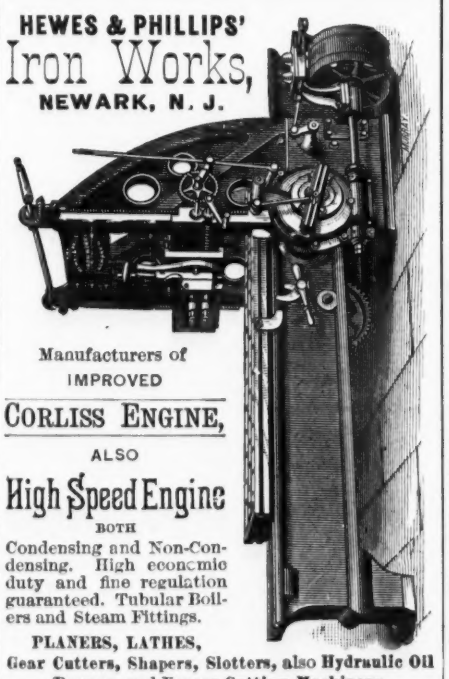

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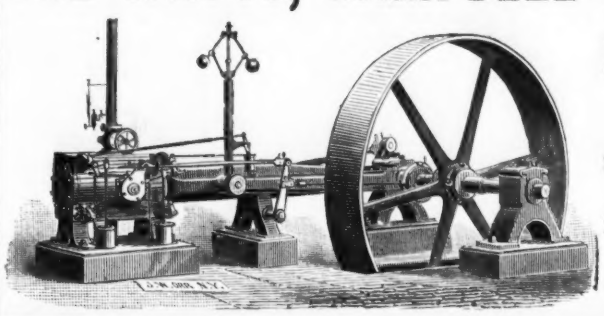

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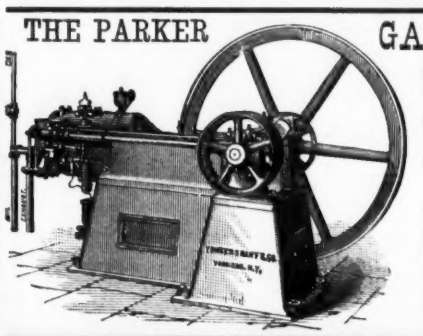

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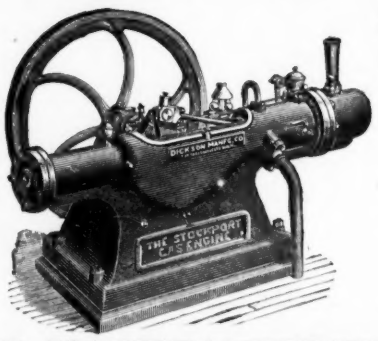

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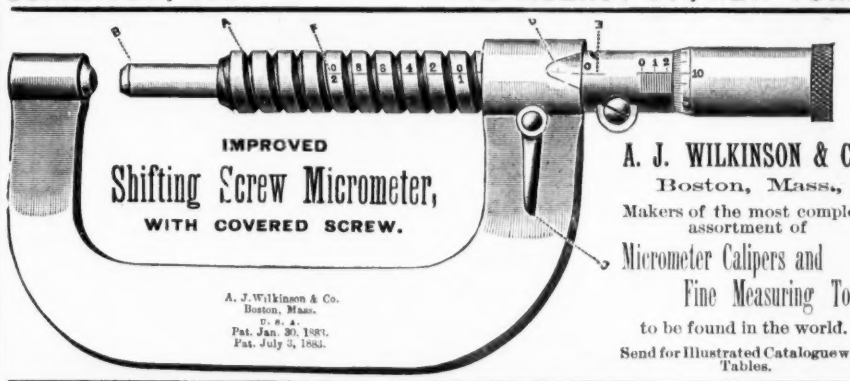

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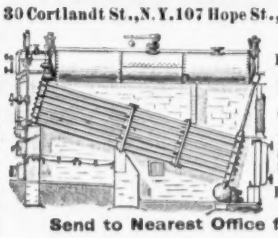

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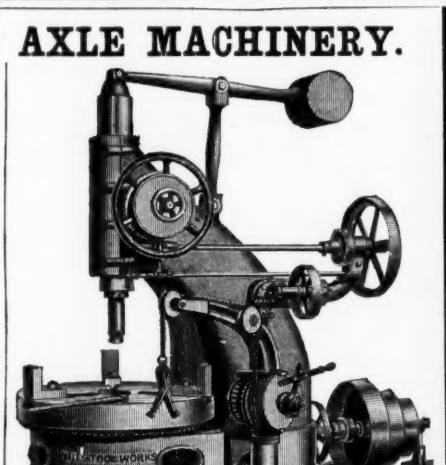

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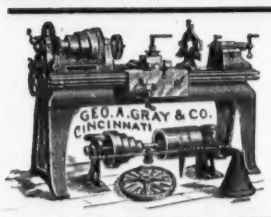

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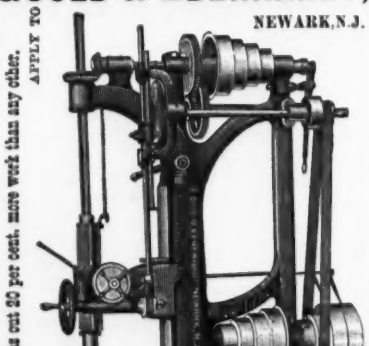

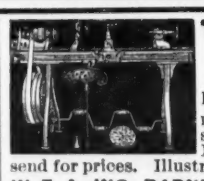

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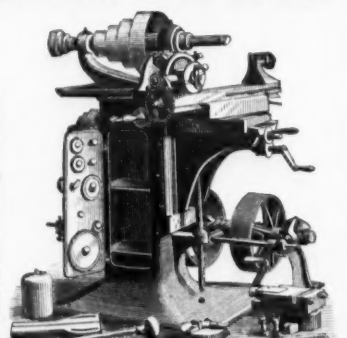

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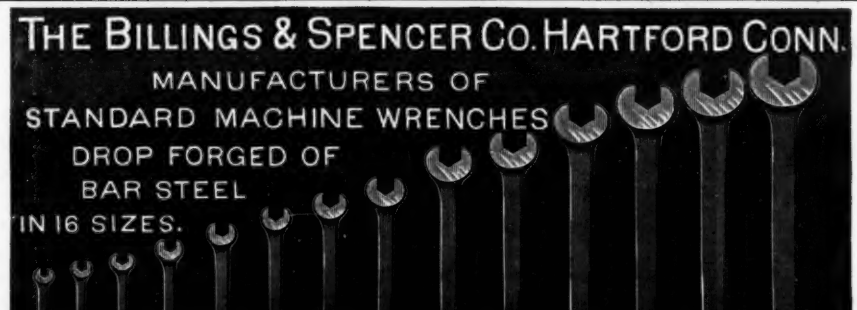

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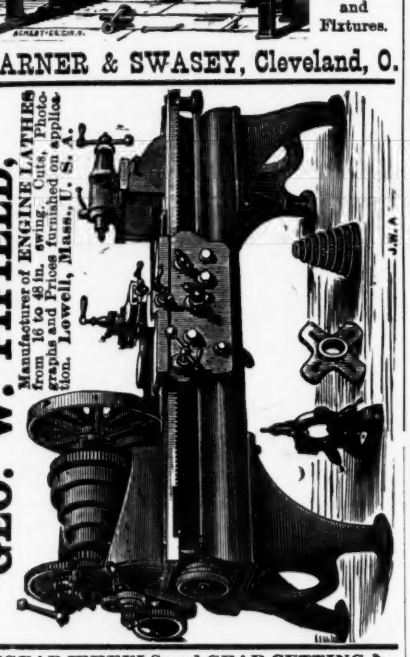

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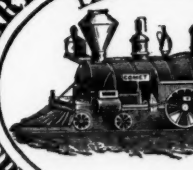

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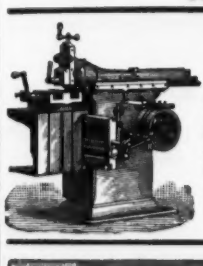

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